Edison Cylinder and Disc Formulas and Manufacturing Processes - Collected Documents 1903 - 1970.

Cylinder Record Manufacture and Wax Formulas
Disc Record Manufacture and Formulas
Taken from various sources.

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Notes concerning Blue Amberol manufacture compiled by Harold Anderson and Paul Kasakove 1970.

Edison Laboratory Notebook concerning Disc manufacture, costs and productiont (N1913-12-06)

Disc Formula Book

Edison's Notes on Releases and Production (E6451-1) 1920?

Letter to Theodore Edison concerning new method of plating.

Notes of Paul Kasakove on Disc Manufacturing Processes 1920 - 1929. (July 1964.)

Cylinder formula for hard regular wax
and molded record composition
1903

FORMULA FOR HARD REGULAR WAX

and

MOULDED RECORD COMPOSITION.

(21.5)
Dissolve 2$.5 lbs. of recrystalized sodium carbonate (Na_2SO_4 $10\ H_2O$) in a steam-jacketed or coil-heated iron cauldron of about 20 gallons capacity, with 10 gallons of water and add 452 ggrms caustic soda (Na OH.) best grade of the commercial article; when all dissolved, add 175 grms. of 20/1000 sheet aluminium cut in pieces about 3" x 12". Turn the heat off the jacketed kettleand allow the metal to dissolve, which will take place inside of three hours.

When all the metal is dissolved filter while still hot through bags made of filtering canvas, such as is used in filter presses. This canvas can be obtained from S. H. Johnson & Co., Stratford, London, England, and from John Johnson's Sons, New York. The cloth best suited for the bags comes 28" wide and the bags can be made 9" diameter by 30" long.

The solution after filtering, if clear, is then ready for making the wax, which is done as follows:

Melt 100 lbs. of stearic acid in a 60 gal. iron cauldron, heated by gas or coal, and bring the temperature to about 240°F. The solution which was previously described is now added as rapidly as it will take it (dipper full at a time) without running the temperature down or wax boiling over. After about 2/3 of the solution has been added it will take proportionately more time to add the balance and the last of it can only be added little by little. The temperature is allowed to run up as the solution is added so that at finish it will be about 360°F.

Then add 21.36 lbs. of purified carnauba wax; the grade known as Sierra #3, and 9/10 lbs. of best grade of lamp black. This is purified by melting in a wooden tank with an equal weight of water, heated by a jet of direct steam and boiling for a short time. Then draw off the water and transfer the wax to a 90 gal. iron cauldron (for 200 lbs. wax) and boilingt the remaining water, and pour out into pans, where it is allowed to cool into cakes suitable for weighing.

After the 21.36 lbs. of carnauba ~~wax~~ is added allow the temperature to raise to 450°F. and hold at that temperature until it is foamed off, which will usually take about five hours.

Then add 21.36 lbs. of ceresin. The wax must now be brought down to a congealing point of (290°) 290 F. by adding stearic. The congealing point is determined by taking a sample of the melted wax in a 6" porcelain evaporating dish and stirring intermittently with a thermometer and noting the temperature at which a skin first begins to form on the surface of the wax.

It will take about 1% of stearic acid for every 5° above (290°) 290 F.

The wax is now ready to filter through an open muslin, then it is ready for use.

Oil for Cores used in Moulding 2060 grms. hard regular wax.

69 lbs. 25° paraffin oil.

1043 grms. #2 Resin oil

Heat together till uniform and cool.

SPECIFICATIONS FOR MATERIALS USED IN MAKING WAX.

STEARIC ACID. Good crystalline texture, with melting point of 136° F. Should be free from oleic acid, and should be condemned if it contains over 3 1/2% oleic. It must be free from mineral acid and salts. It must be free from glycerine and undecomposed fats as tallow, etc. It must be free from mucilaginous substances and hydro carbons.

CERESIN. The melting point should not be lower than 145° F. and should be as high as it is possible to obtain. It should have a fine grain on fracture and should be free from paraffine.

CARNAUBA. Good, clean #3 Sierra.

LAMP BLACK. Very light in weight, fine and free from all foreign matter. Should contain no sulphur, sulphides or grit. It should not be chimney sweepings.

CAUSTIC SODA. Grade running 98 to 100% Pure. Should not contain over 1% chlorides and sulphates. Should contain no potash.

CARBONATE SODA. It should be recrystallized and have formula $NaHCO_3$. It must not contain over .025% of chlorides or sulphates.

ALUMINUM. The pure metal in sheets 20/1000 thick. No tin or other alloys.

[illegible]

Analyses of Columbia and Edison Records
(in court exhibits
American Graphophone Co. vs. National
Phonograph Company. In Equity No. 10
- March Term 1905 - U. S. Dist. Court
Dist. of N. J.)

UNITED STATES CIRCUIT COURT

DISTRICT OF NEW JERSEY

AMERICAN GRAPHOPHONE CO.
VS.
NATIONAL PHONOGRAPH CO. .

IN EQUITY - Nº 10
MARCH TERM 1905

"DEFENDANTS EXHIBIT, STATEMENT OF AYLSWORTH ANALYSES"

Cylinder Nº	1	2	3	4	5	6	7	
Color	*Dark Chocolate*	*Dark Chocolate*	*Dark Chocolate*	*Light Brown*	*Salmon*	*Salmon*	*Black*	
Hygroscopic Water	.10	.30	.10	.00	1.30	.20	.05	
Total Organic	94.16	93.80	94.22	94.80	92.42	93.22	94.85	
" Inorganic	5.74	5.90	5.68	5.20	6.28	6.58	5.10	
Stearic and Palmitic	80.26	81.10	80.12	68.76	86.92	88.00	73.31	
Oleic Acid	3.56	2.98	2.56	1.70	5.50	5.22	2.46	
Hydro carbon	10.30	9.72	11.54	24.34	.00	.00	18.26	
Organic Residue	.00	.00	.00	.00	00	.00	.82	
Alumina [Al_2O_3]	.96	.96	.82	.78	.78	.88	86	
Iron [Fe_2O_3]	.19	.20	.22	.19	.08	.10	.08	
Lead [PbO]	.15	.12	.12	.07	.00	.00	.00	
Soda [Na_2O]	4.50	4.62	4.52	4.16	5.42	5.60	4.16	
Copper	TRACE	TRACE	NONE	NONE	NONE	NONE	NONE	
Calcium and Magnesia	TRACE	TRACE	TRACE	TRACE	TRACE	TRACE	TRACE	
Free Fatty Acids	42.32	41.76	39.68	33.32	53.96	51.84	40.20	

UNITED STATES CIRCUIT COURT
DISTRICT OF NEW JERSEY

AMERICAN GRAPHOPHONE CO.
vs.
NATIONAL PHONOGRAPH CO.

IN EQUITY - No. 10
MARCH TERM 1905

"DEFENDANTS EXHIBIT COMPARATIVE STATEMENT"

	Macdonald PATENT Formula A	Macdonald PATENT Formula B	Aylsworth № 858	Aylsworth № 871	Aylsworth № 957	Aylsworth № 1046	Aylsworth № 1058	Usefull Data	Aylsworth #3 Book #1000	Aylsworth PATENT # 782,375	Storms Formula	Aylsworth № 1029	Formula used as Basis of Calculation
Stearic Acid	408	408	408	408	408	*408	*408	*408	408	408	408	408	$C_{17}H_{34}O_2$ ½ Stearic ½ Palmetic
Oleic Acid	.00	.00	.00	.00	20.4	.00	.00	.00	.00	.00	.00	.00	
Stearate Alumina	48.4	40.6	48.3	41.7	45.	56.9	56.8	60.	26.7	33.5	33.5	37.5	$Al[C_{17}H_{33}O_2]2$
Acetate Alumina (DRY)	15.3	12.9	14.7	12.6	13.7	16.4	16.4	17.6	8.5	10.2	10.2	11.6	$Al_2O_3 2[C_4H_6O_3]2H_2O$
Hydrate Alumina	7	5.8	6.68	5.7	6.2	7.5	7.5	8.0	3.8	4.6	4.6	5.2	Al [illegible] $3H_2O$
Aluminium Metal (Powder)	2.42	2.04	2.52	2.0	2.16	2.6	2.6	2.78	1.34	1.61	1.61	1.8	
Caustic Soda [$NaOH$]	27.2	3.9	30.2	32.0	34.2	31.8	30.1	29.12	3.06	4.08	4.1	32.7	$NaOH$ - 100% Pure
Caustic Soda lye [37.5° B]	85.	12.2	94.4	100	106.9	99.4	94.3	91.	9.5	12.7	12.7	102	37.5 B = 1.35 sp. gr. = 32%
Sal Soda [$Na_2CO_3 10H_2O$]	00	81.6	00	00	00	00	106.2	104.2	93.8	87.7	91.8	00	$Na_2CO_3 10[H_2O]$
Na_2O	21.08	20.2	23.4	24.8	26.5	24.6	23.3	22.5	22.7	22.19	23.9	25.3	
Ceresins Hydrocarbon	72	81.6	.00	.00	00	113.7	113.6	71.3	81.6	87.2	73.4	138	
% Stearic saponified to form normal soda stearate	44.9	44.1	49.9	52.8	56.5	52.5	49.9	48.1	48.4	47.2	49.2	54	$C_{17}H_{33}NaO_2$
Carnauba	.00	.00	.00	.00	.00	.00	.00	.00	.00	87.2	.00	00	

* This Stearic acid includes that contained in the Stearic of Alumina added as such

Ingredients actually used are underscored.

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J. W. AYLSWORTH,
Technical Chemical Expert.
TEL. 404 ORANGE.

...LABORATORY...
No. 223 Midland Avenue,
EAST ORANGE, N. J.

EAST ORANGE, N. J., Jan 14 - 1907

Results of Analysis of Six Records Entered in Suit of Columbia Phonograph Co. vs. National Phonograph Co. + One Columbia Blank Purchased Jan 8 - 1906.

pecimen #	1	2	3	4	5	6	7
Color.	Dark Chocolate	Dark. Chocolate	Dark. Chocolate	Light. Brown	Salmon	Salmon	Black
Hygroscopic Water	.10	.30	.10	.00	1.30	.20	.02
Total Organic	94.16	93.80	94.22	94.80	92.42	93.22	94.85
Inorganic.	5.74	5.90	5.18	5.20	6.28	[illegible]	5.10
[illegible]	80.26	81.10	80.12	68.76	[illegible]	[illegible]	[illegible]
[illegible] Acid	3.56	2.98	2.56	1.70	5.50	[illegible]	[illegible]
Hydrocarbon.	10.30	9.72	11.54	24.34	.00	.00	[illegible]
Organic Residue	.00	.00	.00	.00	.00	.00	[illegible]
Alumina (Al_2O_3)	.96	.96.	.82	.78	.78	.88	[illegible]
Iron (Fe_2O_3)	.19	.20	.22	.19	.63	.10	[illegible]
Lead (PbO)	.13	.12	.12	.07	.00	.00	[illegible]
Soda (Na_2O)	4.50	4.62	4.52	4.16	5.42	5.10	[illegible]
Other.	trace	—	none	none	none	none	[illegible]
Calcium + Magnesia	trace	trace	trace	trace	trace	trace	trace
Total Fatty acids	42.32	41.78	39.68	33.72	53.96	51.34	[illegible]

J. W. Aylsworth

Letters to E. Riehl of Brussels
concernin wax formulas a nd manufacturing
processes (signed D. A. Dodd)
In legal envelope 283)

283

THOMAS A. EDISON, INC.,
ORANGE, N. J., U. S. A.

Typewritten copy sent to E. Riehl at Brussels Sept. 12/04 J.W.W.

Mr. Riehl,

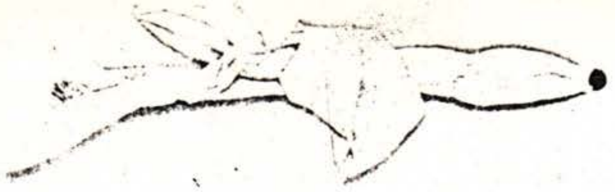
Dear Friend:-

Your letter dated August twenty-second at hand and glad to hear from you. I have made up and delivered for shipment samples of all the different materials that make up our present record wax, also a sample of wax we are using to make our moulded master records of. I have also given Mr. Schermerhorn, Formula and instructions for your use, how to make our present wax using Ebonite. He wished me to give [illegible] particulars wherein it acts different from the old wax in moulding records. There is not a great difference between the working of the two, yet it might cause you quite a little trouble before overcoming them. One advantage of the new wax the moulds keep clean much longer than with the old consequently our records are much cleaner and brighter in appearance, oftentimes it is not necessary to clean the set of moulds more than twice a [illegible] where with the old, the moulds have to be cleaned every four or five rounds. One of the troubles we had when we first used the new wax were rings, they were overcome by letting the cans drop a little slower, when we let the cans drop in five seconds we reduced the speed to seven with the new wax. You will also have to run the jackets a little warmer in [illegible] so that the moulds retain some the heat before dipping, or you will get an uneven flow of wax in the mould, showing on the records in small spots as though air was incased. The moulds going in the wax a little warmer it is necessary to leave them on the bench a little longer with the jacket it was dipped in before being trimmed, that is before the surplus wax is trimmed off each end, the dipper should have three on the bench all the time, that is four moulds should be dipped consecutively not four dipped at once, and then all four trimmed as we have had some of our dippers do at times but after the fourth mould is dipped and on the bench the first is ready to be trimmed, leaving the three without being trimmed until another one is taken out and one put in. The man reaming should keep his end up also, not more than one or two moulds on his bench at a time. The other trouble we had was the wax not leaving the can as easy as with the old wax, that has been overcome through the new dipping can, which is made double, one can inside another with air space between, this new can is not altogether necessary as we have only two kettles equipped with new cans, the others using the old style. Now regarding Master records made from mother moulds, we are using the regular dipping process, the only difference being, instead of using one of the regular moulders dipping kettles I set up a small circular kettle and mounted two [illegible] machines on top with small kettle alongside holding five or six gallons of wax to supply the hot wax from.

We are having very good results; with four men we obtaining from fifty to eighty good master records a day (ten hours work) that pass machine and thread tests. The process you referred to in your letter to Mr. [illegible] is not a success as yet, so I would advise you to do as I have done, the wax I use is same as sample referred to above. It is made according to the formula you have, using carnauba, with this exception, the lamp black is omitted and 2% more Carnauba added. I am sending with the samples of material one of the new dipping cans with frame, so that you can see how it is constructed, it is quite necessary that the cans should be made of the different metals that this can is made up of. I thought it might be of interest to you, for me to explain how we obtain the best flow of wax in our moulding kettles, as I suppose it will not be long, if you have not already had to take out some of your kettles for repair. Now the first thing to be done when a kettle is taken out of a furnace is to have the top plates leveled, as a great deal depends on this, then set the kettle in a wooden frame or crib that is perfectly level so that the kettle will be supported by the flange same as in position in furnace, then the partitio on each side running parallel with the sides of kettle should be leveled on an incline, the partitions on each sid of kettle nearest to perpendicular shaft should be 1/4" higher than at opposite end of kettle running on a slant the partition on side of kettle where the wax comes up should be 1/8" lower, running full length of kettle than on opposite side, where the wax crosses over, before going down through slot to circulator tube. On the side of the kettle that the wax flows through the slot to the circulator tube, eleven of the twelve cross partitions should have a piece of the metal cut out even with the partition running parallel with the side, and the side of the kettle, and about 2 1/2" high, care being taken that there still remains metal on the partition above the wax to bolt it to the side of the kettle, this forms a trough from the partition next to circulator shaft to the far end of the kettle this aids very materially in carrying away the thick conjealed wax. If the instructions are carried out each of the twelve pockets in the kettle will have a uniform flow of wax.

Hoping you will have no trouble in understanding the above instructions.

I remain yours Respectfully—
W. A. Dodd.



Sept. 5th. 1904.

Wax Formula.

Typewritten copy
Sent to E Riehl
at Brussels Sept 12/04
Jww

Formula for making wax for moulded records, using Ebonite as a substitute for Carnauba wa, Heat 41.9 lbs. Ebonite in a suitable iron kettle, over fire to 350° Fahr., then add 74.29 grams copper in fine powder in the wet state, and stirring constantly while it is foaming off.

Then add one hundred (100) lbs. stearic acid, when this is melted and reaches 350° Fahr. commence adding aluminate of soda solution that has been previously prepared; adding a dipper full at a time until the solution is all fed in. The temperature of the wax should be gradually raised while the solution is being fed in, when the last of the solution is fed in, the thermometer should register 450° Fahr. After again foaming off, add 7.377 lbs. Ceresin wax, when this is melted and mixed in add 3.14 lbs. wood pitch previously prepared as will be explained below. When the wax is thoroughly foamed off the congealing point should be brought down to 290° Fahr. by adding stearic acid, Then filtering through a muslin filter it is ready for use.

The copper powder is prepared in the following manner. Take 143.38 grams sulphate of copper dissolved in 500cc of warm water, with 10cc of Sulphuric acid. add to this in small quantities at a time 41.78 grams metalic zinc,

either thin sheet or in powder. If more convenient to get the sheet zinc, it will answer equally a well as the powder, by cutting it in narrow strip and rolling up loosely before using it.
The zinc when added to the copper solution displaces or precipitates the copper in a fine divided state, in bottom of vessel used, care should be taken that no more zinc is used than just enough to replace the copper in the solution. The precipitated copper should be washed in several changes of boiling hot water until all traces of zinc and acid are gone before using. The Aluminate of soda is made by dissolving 22.6 lbs. recrystalized sodium carbonate $(Na_2CO_3\ 10H_2O)$ in a kettle heated by steam or over a fire with 4 gallons. of water, and add 474.74 grams Caustic soda $(NaOH)$ best commercial article that can be obtained, 98% and 183.72 grams pure sheet aluminium 20/1000" thick, cut in small pieces, when the metal is all dissolved, filter through canva The solution is ready now for making the wa
For preparing the pitch take a quantity of pine tar and boil it down to about one half its bulk or until it appears to have acquired a proper consistency, this can be seen by taking a smal quantity in a cup and setting aside to cool. If quite hard on cooling it is ready for use.

Price of the different materials used.

Stearic Acid	.11 per lb.
Ceresin wax	.17½ " "
Sodium Carbonate	.018 " "
Caustic Soda	.05¼ " "
Aluminium	.42 " "
Ebonite	.08½ " "
Pure Sulphate Copper	.06¾ " "
" Sulphuric Acid	.08 " "
Pine Tar	.11 " gal.

Using material at the above prises the wax will cost ten and three quarter cents per pound.

D. A. Dodd.
J W Aylsworth.

Suggestions and instructions for making records from mother moulds.

1. The regular dipping kettles are not used. A ninety gallon capacity kettle on which is mounted two regular dipping machines is employed.

2. Another kettle of about ten gallon capacity is placed along side the larger kettle for the purpose of replenishing the wax in the larger kettle, keeping just enough wax in the small kettle for immediate use.

3. Regular moulded record wax is used, with the following exception: lamp black should be omitted and 2% more carnauba wax added. Please note that we are using the carnauba formula - not the ebonite formula.

4. The temperature of wax in dipping kettle should be kept about 290° Fahr. - or as near that temperature as possible, before starting to mould. Morning and noon the temperature of the wax should be raised to about 300° Fahr. and well stirred so as to break up and melt the congealed wax bringing the temperature down to 290° Fahr. before starting to mould records. The wax in the supplemental kettle

should be run at a higher temperature, a fair average bing about 310° Fahr..

5. The oven is supplied with 14 special moulds and 40 regular jackets. Before starting to mould, the moulds and jackets assembled should be heated to a temperature of about 90 to 100° Fahr., this temperature of course cannot be absolutely fixed: it is governed later by working conditions as will hereafter be explained.

6. The moulds after being placed in the dipping machines should be dipped the same as the regular commercial record, the time of immersion bing about two minutes, this includes the lowering of mould and time of immersion in wax.

7. After the first mould is dipped and taken from the dipping machine it is laid one the V block and another mould placed in dipping machine and lowered in the wax, then if the two minutes time has elapsed for the second dipping machine the mould is taken from it and placed on the table, and another mould placed in the machine and lowered in the wax. There should be one mould waiting on the table to be trimmed at all times.

8. The mould resting on V block is now taken out of jacket and trimmed, one to one and a quarter minutes should elapse from the time it is taken from the dipping machine until it is taken out of the jacket and trimmed, the jacket should be placed on the table until eight or ten accumulates and then placed in a tank of water. which has a temperature of 88° to 90° Fahr.- so as to reduce the temperature of the jackets to the temperature required for extracting, as mentioned hereafter. Eight to ten jackets may be taken from the cooling tank at a time and wiped dry placing them handy for the man extracting. After the mould is trimmed it is immediately reamed with first and last knives only to reaming machine, leaving the record with a solid bore instead of a ribbed bore. We are using a small hand reaming machine with one knife, thus the reaming is made with one operation.

10. After being reamed they are placed in cooling jackets which should have a temperature of 88 to 90° Fahr.-

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11. After being placed in the cooling jacket it is put on the extracting machine and left until its own gravity forces it out. In other words this statement is not absolutely true, but it must not be forced. In other words, they are left on the extractin machine a little longer than is the case with the commercial record, so as to absolutely avoid scratching the record. Time consumed in trimming, reaming and extracting label records, about three minutes, one minute longer for moulds without the label. The water that circulates through the cores should have a temperature of about 104° Fahr.-

12. After extracting, the records should be placed on the metal cores, being sure they bottom on the board holding cores. The cores should be warm, having a temperature of about 95° to 100° Fahr. - They should be left on the cores about two hours before knocking off.

13. The moulds and jackets as left by extractin machine including interval before again being placed in dipping machine make them of proper temperature for again dipping

there are from 4 to 6 moulds on slide a head of dipper most of the time. Time consumed from time mould is dipped until it is dipped again is about fifteen minutes for label moulds and sixteen minutes for the plain moulds without the label, it takes about one minute longer to extract the record from the plain mould.

14. When the records appear streaked or dirty after extracting the mould should be washed in benzole and dried and polished with a soft chamois, and then placing the mould in a hot jacke for a few minutes to heat the mould befor placing it in the jacket that was used to extract the record from it on extractingmachin The above instructions cover the ground in a general way. After having been left on the core two hours, they are then knocked off and go through an eye inspection also for out of round and off gauge, the records that stood this inspection are now left to stand until the following day, when they are given a similar inspection as well as a machine and thread test, this inspection is severe. The thread should gauge at or between the following limits at the differen

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degrees of temperature as follows.
at 70° Fahr. 3/4 thread short 1/2 thread long.
" 80° " 1/2 " " 3/4 " "
" 90° " 1/4 " " 1 " "

The records should be kept over night in a place at an even temperature preferably where it is intended to guage them so that the records may have contracted properly to the temperature of the room.

We are using entirely new wax for manufacturing these records although it is not necessary as we have taken the same wax left in kettle at the end of the week and filtered it through a muslin filter and used it the following week not noticing any change in the making of the records other than the color which is much darker. The scrap wax such as trimmings and defective records are put back in the small melting kettle and remelted for supplying the larger kettle with same as in our regular moulding process. By mixing lamp black with this wax it may be used for moulding our regular records.

Oct 14th 1904 D. A. Dodd

East Orange, N.J.
Oct. 19th 1904.

Mr. E. Riehl,

c/o National Phonograph Co.,
84 Rue Scheutveld,
Brussels, Belgium.

Dear Friend:

Your letter of September twenty-fourth received. We use the same formula for making the wax for regular blanks as is used for making the special blanks. We have enough special scrap wax to take care of the blank business. The color of our regular blanks is due to long cooking in an iron kettle. We mix the scrap from the regular wax with the special scrap in the proportions of 3 of regular to 2 of the special. Since we have had cooler weather I have had to soften the wax for making the master records from the mother moulds as we had trouble from the records cracking while moulding, also Mr. Albert Wurth complaine of the wax chipping when engraving the titles, making a rough edge to the letters. This trouble was overcome by adding 2% more ceresine. Our percentage has been much better since we made this change in ou formula. I neglected to say in last lette that the moulded master records shrunk while on each end more than in the center causing a small ridge that is apt to make the cylinder off gauge or out of round, thi we scrape out with a knife as soon as they are taken from the cores, while the wax is still soft.

Respectfully
D. A. Dodd.

Copy

Orange, June 20th, 1905.

Formulae of wax for moulding master Records from mother moulds.

This formulae to be made up under the directions given to make wax, using Ebonite as a substitute for carnanba wax.

100 lbs.	Stearic Acid
64 lbs	Ebonite
22.13 lbs	Recrystalized Sal Soda
468.5 g'ms	Caustic Soda
113.47 "	Copper Powder
181.28 "	Aluminum

With this formulae no ceresine is used.

D.A. Dodd.

To Rieke
6/27/1905

June 20th 1905

Formulae of wax for moulding Master Records from mother moulds. This formulae to be made up under the directions given to make wax using Ebonite as a substitute for carnauba wax.

100 lbs	Stearic Acid
64 ..	Ebonite
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With this formulae no ceresine is used.

D. A. Dodd

Notes of Harold Anderson and Paul Kasakove concerning cylinder record manufacture. 1970.

7/4/70

Harold

I'm afraid I can't help you with this. According to my recollection, we did not make Sub-Master or Female Moulds for Cylinder Records. We made a Wax Master, and a Copper Master from the Wax Master, then made the Wax and Blue Amberol Records from the Copper Master.

Kas

HBA asks: Can a nickel female cylinder be made from a copper m

The answer, as expected, is No

Can a wax or Blue Amberol "female be used to make more than one Cu submaster or working m

The answer seems to be PERHAPS, but not needed or done in Kas' period.

Popular numbers have high sub numbers;

BA Red Wing – Potter 1543-(121) Tape TR-BA-7

BA Silver Threads – Will Oakland 1547(312) Tape TR-BA-8

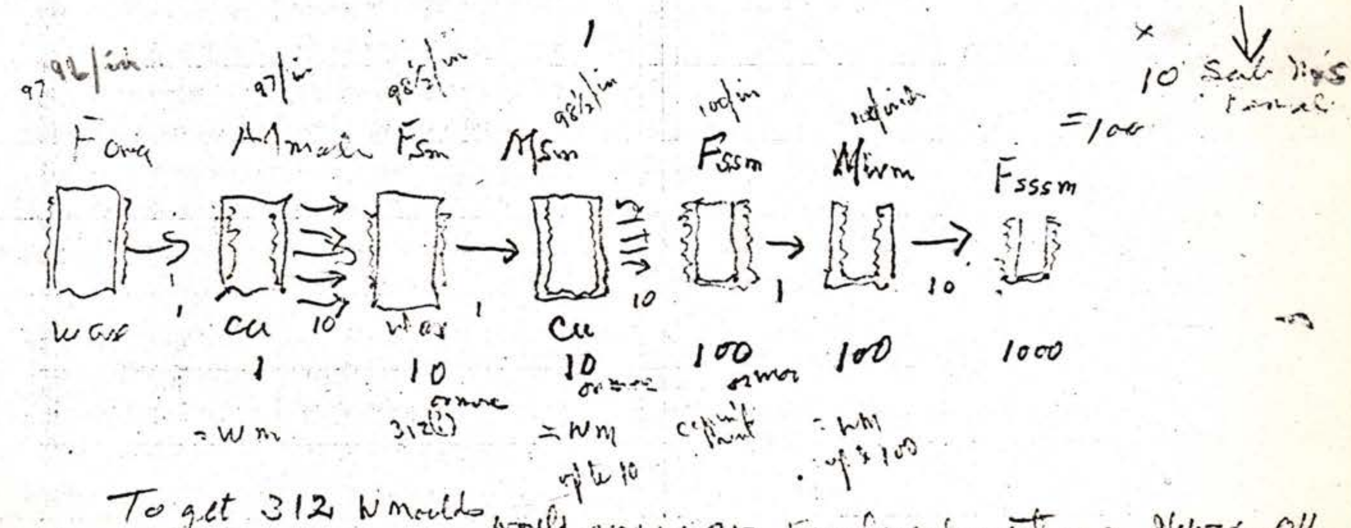
This suggests each working mould had its own number, which in turn suggests that it was made from a wax (possibly celluloid?) female master which was used only once, and had its number stamped or engraved on it after being taken from the male master.

for # 1547 This would mean that 312 female masters (= matrices) were made from the metal male master, which would all be descended from the single original wax that was O.K.'d by TAE.

1 → 10 ? × 1 = 10

Wax original → Cu Master → Wax submaster (celluloid?) → New Copper master

Female Male Female Male



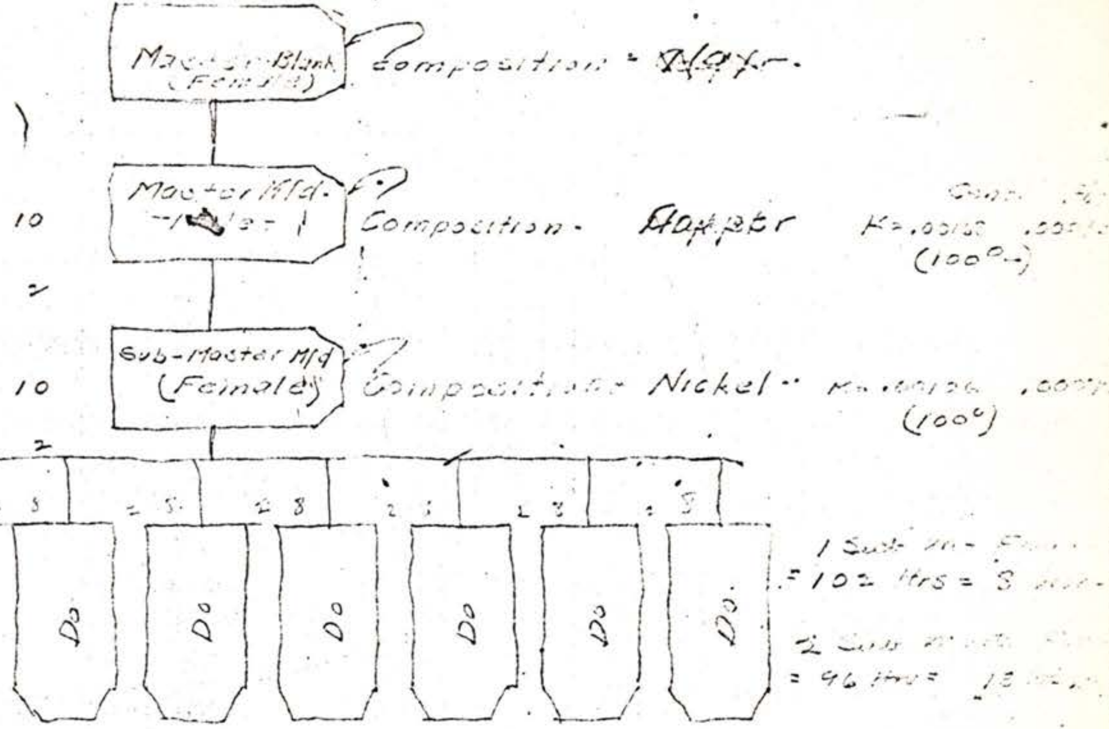
To get 312 W moulds would require 312 Female submasters. If true, OK.

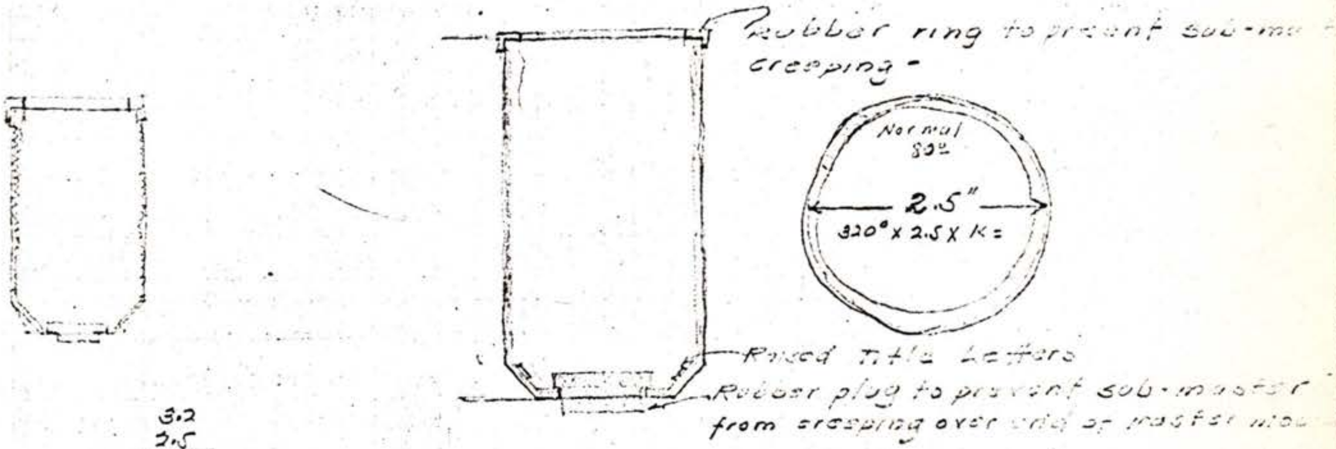
[illegible]

– Striping Process for Cylinder Moulds –

.00093 Co
.00070 Ni
.00023

.00093 x4 = .00372
.00070 x4 .00280
.00092




Rubber ring to prevent sub-ma[illegible] creeping –
Normal 80°
2.5"
320° x 2.5 x K =
Raised Title Letters
Rubber plug to prevent sub-master from creeping over end of master mou[illegible]

3.2
2.5
160
64
8.00

.00093
8
2).00744
.00372
.00280
.00092

.0007
8
2).0056
.0028

3.1416
2.5
157080
62832
7.85400"

3.2
7.8
256
224
24.96

24.9
93
747
2041
2).021157
.011157
.00871
.002447

7
2).01743
.00871

$\frac{7.85 \times .00093 \times 320}{100} = .0234"$
$\frac{7.85 \times .00070 \times 320}{100} = .0176"$
.0058"

7.85
3.2
1570
2355
25.120

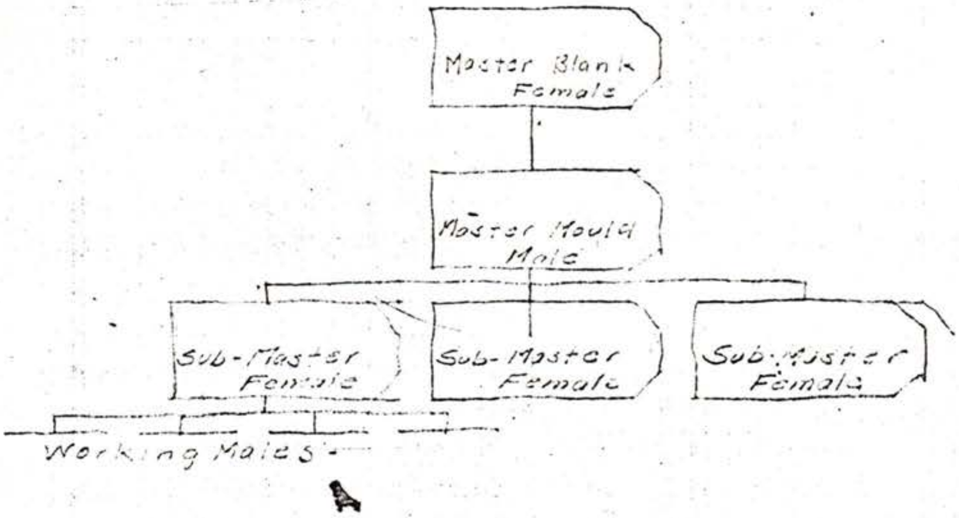
7.85
320
15700
2355
2512.00
.00093
7536
22608
100).0233616 (.023361

7.85
7
.005495

5.495
32
10990
16485
1.75840

.00093
7.85
465
744
651
.0073005
320
1460100
219015
2.3361600

.. A-1
.. B-1
.. C-1

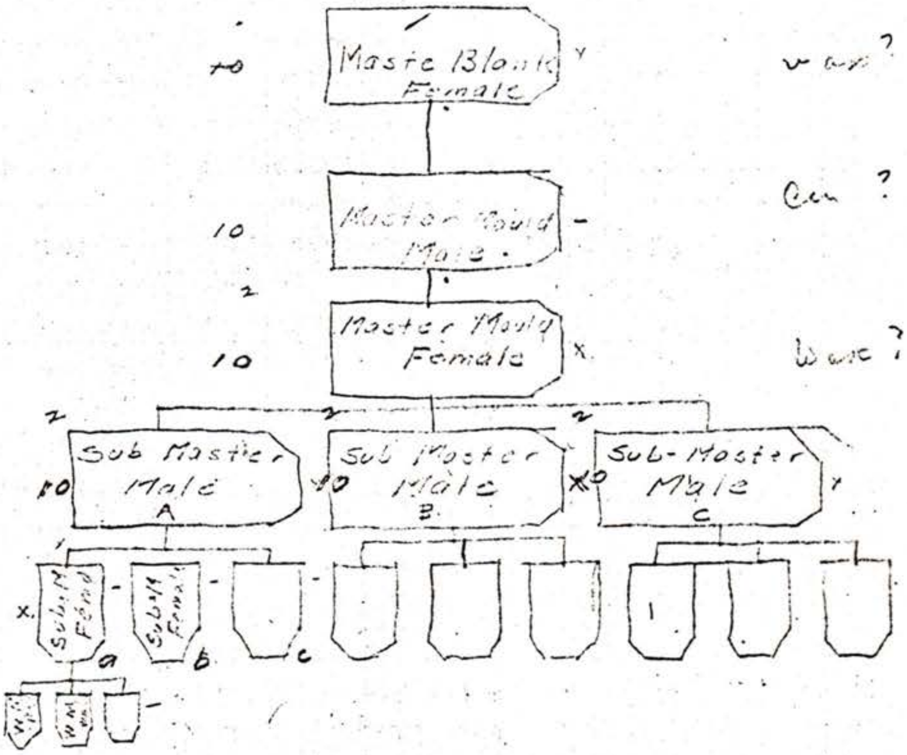


Wax

Cu

Wax? in order to engrave title & number [illegible] BA

Ni



wax?

Cu ? How make 10 ?

Wax ? 10 and up?

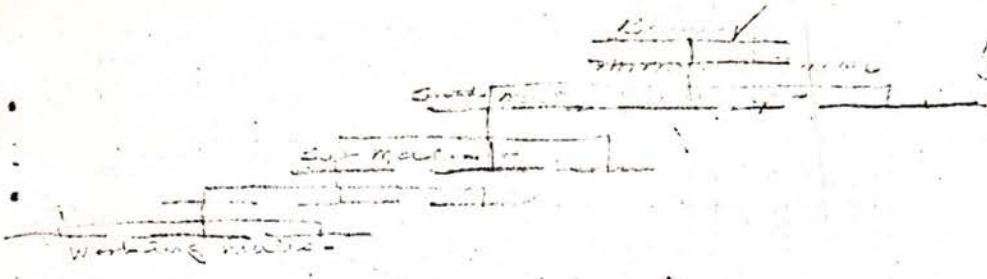
Cu

Wax [illegible]

3 [illegible]

.Aa1 .Ba1.Ca
.Ab12 .Ba2.Cb
.Ac1 .Ba3.Cc

HSK



(Cu) "mould" [illegible]
(wax) Master [illegible] a [illegible]

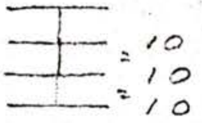
Copper in his Submaster Masters 1 only
Wax Submasters formerly, working masters 1 only.

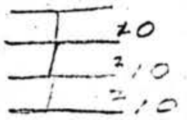
Significance of $\frac{2}{10}$?

Possibly 2 minutes from 1 [illegible] by stretching?

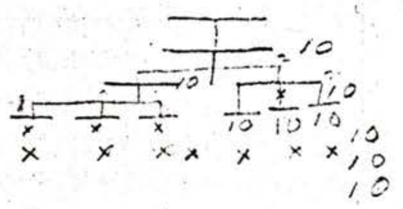
Possibly 10 [illegible] from 1 [illegible] master or submaster to make good [illegible]? HSK

Possibly 10 hrs. plating time 2 hrs. interval between plating operations? HSK





5, 5 6/1 — 56/5



Edison Notebook N1913-12-06
concerning Disc manufacture, costs
and production

P. 21

N. 1913-12-06
1914-04-23

P. 9 "Wickersham 12-6-13"

P5 note "4/23/14"

P. 14 "Dec 1 - Jan 3 · 1914"

P17 "1/30/13 · Signed JTR"

P. 18 " Dec 3 - Jan 3 · 19(?)
P. 19 "add Dec 2, 1914" (1913?)
P. 24 "Oct 11 - Mar 28" NY Recording
"July 31 - Dec 31" London Rec
P. 25 "Redfern 4/23/14"
P 26 "Cost of 4 mo.
March 1 - July 1 - 1913"

Entries not clearly dated.
Per P. 17, it could go back to
12/1/12. Check Studio
works for page 18 dates.

N-13-12-08

Acme Co.,
MFG. STATIONERS,
69 FULTON STREET,
NEW YORK.

40613

3-12-08

Wt. submaster mould - tuned 2# 4.5g (only 1 weighed)

Amber Rosin

Fundamental Elements

White master Blank
Master Mould
Second & Submaster Blanks without celluloid
" " " with "
Label Blanks without condensite
" " with "
Label masters (electros)
Labels moulds
Powder Blanks
Varnish.

absolute [illegible]
Checked finally by Mr. Hoffman

Submaster Blank
Wt 1000 gm + 15 gm Cu
Material

100 lbs	Wood flour	=	$ 1.1850
100 "	Resein	=	14.8000
100 "	Denat Alco.	=	4.1333
2½ "	Gas Black	=	.1625
202½ 3 "	Copper	=	1.4825
			21.7633

The above will make 92 Blanks
of 1000 gm. each [= 2.203 lbs. Double this? 456]
Material cost of 1 blank $.23[illegible]
From Hoffman.
Does not include celluloid -

80% alcohol recovered
15 gm cu to each blank
The powder for this blank is not weighed
- out being merely put into mould
and leveled off. Varies from 950 to 1050 g
Av. 1000 gm.

Correction for alcohol 80% recov. makes alcohol cost
only .8266 making total cost 92 blanks 18.4567 or ~~¢~~ [illegible]

Labor.

100# resin making : .4222
100# " grinding = .1000
200# Gum mixing = .0333
202½# Powder " = .2000
202½# " drying = .5700
202½# " grinding = .3832
202½# " moulding = 3.6800
Inspection = .4000
$ 5.7887

The above labor for 92 Blanks
Labor cost for 1 Blank $.0629

Material .2365
Labor .0629
$ .2994

100 blanks weigh with Cu on 220.5# result of test
4/23/17

C 204.

Absolute minimum
Checked finally by Dr. Hoffman ✓

Req. Powder for Commercial Blanks

100# wood flour	$ .01185#	1.185
2# lamp Black	.065 # ✓	.130
25# Phenol Resin	.148 #	✓ 3.700
472 gm 6/# = 1.0384#	.48 #	.498
45# Denat Alco. hol	31¢ gal	1.860
(1 gal alco = approx 7.5#)		$ 7.373

checked Nov 25 1918

Wt of blanks 350 gm = .77# ok

Add 1% of Phenol Resin of Paraphenylenediamine Nov 25 1918

100# + 2# + 25# + 1.038# = 128.038#

128.038# ÷ .77 = 166 blanks

7.373 ÷ 166 = $.0444 per blank
material only.

80% of alcohol recovered OK. Checked

Hence 7.373
1.488
$ 5.885

Credit for saving alcohol 80%

5.885 ÷ 166 = .0354 ¢ per blank

5848 Gal Denat Alco. used in branch
4859.5 Recovered } 84.5% Recov
237525 blanks made

Disc material & Blank moulding - Labor

Blank mould	Disc mtl	number made	Date week ending
433.70	565.46	22156	12-6-13
507.20	577.15	16466	12-13-13
606.10	662.64	35583	12-20-13
693.80	667.19	32760	12-27-13
714.90	683.77	42639	1-3-14
Total $ 2955.70	3156.21	149604	

2955.70
3156.21
\$ 6111.91 labor costs to make 149604 blanks

Labor cost per blank \$.0409

Using last week in list - Dec 27th to Jan 3rd
Labor costs per blank \$.0328

Cost of powder blank labor & material
Per blank. \$.0682

Wax → Plated Cu → Celluloid White
(10 or so)

Celluloid White → Cu → Ni Female → Working Mn
→ 10 or so → 10 or so → 10 or so

1 wax × 1 Cu × 10 × 10 × 10 × 10
Wh Cu Ni WM = 10,000 WM

or

Wax → Cu → White → WM = 100 WM
10 10

Nickel is not mentioned in N 13-12-06

N. 13-12-06
Cost data on
Mfre. of Diamond
Disc Records -
1913-14

"Transfer process"?

Found in Misc Elec -
Library?
Bldg # 4?

Page 1

White Master = Wax Master

Master Mould = "Copper Master"

celluloid master?

Second Master =?→ "Nickel Master"
For Preservation?
or "Nickel Female"
in needle trade - called "Mother"

May be equivalent

Third Master "Working Mould"
For making working moulds??
equivalent to "Stamper"

Early terms used - Later Terms

✓

Regular Varnish.

mix
5# Phenol
2# Paraphenylendiamine
7.9# 6/4
x 4# Penta Chloro Phenol (washed) {25% lost during washing etc. / 25% to cost TAE
145# Denat. Alcohol (19⅓ gal)
100# Phenol Resin

2639#

add 1# Sandarach

5 Records both sides, i.e., 2 plates to lb of Varnish – we use 45 cc on each plate or 90 cc per record.
About 5 Records to lb.
$.0218 per record for Veneer
TAE. (See other book)

Alcohol varies with viscosity of resin from 138 to 145# None recovered

Lost in washing 2 to 5%. Lost thru insolubility 12 to 27%. The bracket estimate to right of item above include both & is fair average. The 4# means soluble Phn

Per lb	Per batch
$ .07875	.39375
.625	1.25000
.48 ✓	3.79200
.50 TAE ✓	2.50000
.31 gal ✓	5.99333
.148	14.80000
	Total $ 28.72908

Cost of Varnish
per lb $.1091

$\pi R^2 = 3\tfrac{1}{7} \times 25'' = 75^{\square''} = 450^{ccm}$ ie varnish = .1 cm thick?
(?) "Transfer plate method" etc.

ta

Material that goes into 1000 10" records
— RAW. — Powder blank & varnish

198# Formaldehyde.	8½¢ lb	16.83
581# Wood Flour	$23.70 a ton	6.88
14.5# Lamp Black	6½¢ lb	.94¼
170.5# Denat. Alco.	31¢ gal=7.5#	7.04 3/5
3.5# Pentachlorophenol	48¢ lb	1.68
3.0# Paraphenylenediamine	62.5¢ lb	1.87½
188.5# Phenol	7⅝¢ lb	13.834
6.5# %	48¢ lb	3.12
		$ 52.205

The above are the materials raw - as bought outside - that go into Transfer blank

Materials used other than the above amount to about 3% of the value of the above.

Varnishing Room

Materials used Dec 1 - Jan 3 - 1914

Mill Ends	15# per week	16¢#	12.00
Alcohol	347 gal	27¢ gal	93.69
Rubberset Brushes	3 per wk	$5^{\underline{10}}$ dz	6.38
			112.07

Number plates del to ovens Dec 1 - Jan 3
275567

Mill Ends & Brushes are probably put in under general Expense leaving only alcohol as material expense.

Material Cost per plate
93.69 ÷ 275567 = $.00034

15

Express on Masters
from Rogers.

Date Received	Quantity	Express	Chgs.
Received During Month of Dec.			$
Dec 2	20-10" master	Coll	.50
" 8	30-10" "	"	.75
" 10	10-10"	"	.25
" 13	10-10"	"	.25
" 17	20-10"	"	.50
" 26	60-10"	"	1.50
" 31	20-10"	"	.50
	170		$ 4.25

Forwarded during month of Dec

Rq. 18374	50-10"	65¢
" 19326	50-10"	65
" 20089	50-10"	65
" 21018	50-10"	65
	200	$ 2.60
		4.25
		6.85

1/30/13 Signed J.T.R.

(should be 1/30/14 ?)

18

See also pg 24

Master Record Costs. Dec 1 Jan 3 19
Disc Only.

		No per week
Jan 3	999.20 –	10
Dec 27	1608.41 –	13
Dec 20	1670.43 –	15
" 13	1515.31 –	15
" 6	1297.68 –	15
	7091.03	68

Av. no. copies of each tune 2½
68 × 2½ = 170 masters.

The above includes all recording cost except cost of White wax blanks –

Eckert ?

42 Amberol [illegible] selection were made Dec 1 – Jan 3

68 Disc + 42 Amb. = 110 selection

110) 68 (62
62
20

Charge 62% overhead in Dept 15
to Disc

19

Cost of Purifying #097 Graphite

from Christensen Apr 21-15

10# of #097 Graphite @ 15¢	1.50
10# of Caustic Soda @ 6¢	.60
Heating in Furnace 8 hours	4.00
10# Hydrochloric acid @ 5¢	.50
Labor @ $2.00 a day 3 days	6.00
	12.60
Overhead 40%	5.04
Total	17.64

There is a loss of 15% of the Graphite in form of impurities - leaving 8.5#

```
8.5 ) 17.640 ( 2.07
      17 0
         640
         595
```

Purified Graphite #097 Cost $2.07

Add Dec 2nd 1914

Nitric acid @ 5¢ lb } total 25¢
Sulphuric acid @ 2¢ lb } per lb graphite

$2.07 + .25 = 2.32 per lb

Phenol Resin.

7.875 cents

1050# Phenol @ ~~[illegible]~~ ¢ lb

57 to 60% of wt of Phenol Formaldehyde 5½¢

av. 609# or 58%

55% night or Nov 25 - 558#

% Formaldehyde det. by the amt of Phenol Recovered.

Phenol Recovered in varying amts.

The batch yields about 900# of Phenol Resin. .850 now Nov 25

Theoret cost for material 14.94 ¢ lb.

.156 ¢ lb Nov 25

Formula for Solution #1 for sticking Celluloid to powder blank.

2000 cu centimeters of Amyl Acetate
Com. technical.
500 gm gum Camphor

2000 cc Amyl Ac. @ $ 1.75 gal =	.84
500 gm Gum Camphor @ .50 lb =	.55
	1,39

[1.75/3875 = 000·42 per cc (x 2000) = .84]

[500/.450 = 10/.9 lbs @ 50¢ lb = .55].

	$
Total material	1.39
1/4 day's time @ $3.50	.875
	2.265

Cost - L. & M. one batch $2.27

Batch will cover approx 1359 discs.

Cost per 100 discs $ .1669

Cost of Celluloid Discs and the approx. cost of materials used in connection with the making of second master and submaster blanks after the blanks have left Hoffman's dept.

Celluloid Discs
Purchased from Celluloid Co @
$15.50 per 100 - 2 used for each blank $31.0000
Dipping Sol. (No 4-1)
Obtained from Lab at approx cost
per 100 blanks 2.9000
Sticking Sol. (No. 1)
Obtained from Lab at approx cost
per 100 blanks .1669
Denatured Alcohol
@ 31¢ gal - per 100 blanks .0183
Prepared Cheese Cloth.
Cheese Cloth @ 4½¢ yd cost
per 100 blanks $.5882
Varnish prep by Hoffman at
approx. cost (for materials of
$.56712 per gal - cost per 100 bl. .4458

1.0340

Total cost materials per 100 blanks $35.1192

Approx Cost (of Materials) per Gal. of Varnish used in prep. Cheese Cloth. for 2nd & submaster Blanks.

Phenol Resin	
1.413 lbs at $.148	$ .20912
6/4	
$\frac{1}{10}$ lb at $.48	.04800
Denat Alcohol	
1 gal used per gal varnish	.31000
	$ .56712

(This figure includes neither labor nor [illegible] from dis cards)

Recording Dept N.Y.

All charges including all salaries, proportionate share of rent & all overhead expenses Oct 4th Dec 31st inclusive
Also talent. $37,376.75
During this time 307 selections were made
Av. 2½ masters per selection gives
768 masters
Cost of Recording Dept. per selection $121.75

This does not include cost of blank.

Recording Dept London.
July 31. to Dec 31 inclusive.

Same as above	$11,815.04
Number selections made	59
Av. cost each selection	200.25

Cost of White Master Blank.

Composition — Redfern 4/27/17

4550 gm. Caustic Soda $1.74¼ per 100 lbs
1750 gm Aluminum Metal 34¢ per #
88 # Recrystalized Sal Soda $.01 83/100 per lb.
30 gal water
1000 # Stearic acid $.10¾ lb
75 # White Vaseline $.18 lb

Weight of batch 1040 #
Estimate only 75% available for use

After wax is made and put thru separator it is sent to moulding room for moulding. The hot wax is poured in moulds and let stand until cold. The blank after seasoning for 3 days in [illegible] [illegible]

Redfern's figures

Rough wt. 3.8 #
Finished wt 2.315 #

(26)

Cost for 4 mo. March 1 – July 1 1913 Ref.

During period there were 1248 finished planks accepted by final inspectors at TAE Orange.
To get these 2070 blanks had to be made by Hoffman.

Hof. material for 2070	988.14
Labor " " "	59.38
adding Wks expense at 10% & freight etc. total →	1656.02
Recov. Scrap wax 4977.4 at 10¢	497.74
	1188.28
Labor in making 1248 finish planks	247.24
Ex. Shaving Dept 40% of labor	98.90
	1534.42

1534.42 ÷ 1248 = $1.23 each

Does not include can or packing or shipping to & from N.Y.

1913 Refs

1248 finished
al imperfections

had to

987.74
58.38
total →
by 1656.02
loss 497.74
1158.28
Planks 277.24
98.90
1534.42

or packing
ly.

Formula for filler for disc record numbers.

450 gm Egg Albumin @ .85 lb	.85
4500 gm Water	.0000
2550 gm Zinc Oxide @ $.06\frac{1}{8}$	.3448
	\$ 1.1948

Zinc Oxide @ $6\frac{1}{8}$¢ lb 300 lb lots

$\frac{2550}{453} = 5.63$ lbs $\times .06\frac{1}{8} = .3448$

Material	1.1948
$\frac{1}{4}$ days time (1 day every 4 batches) @ 3.50	.875
	2.0698
Total cost for 16.6 lbs	\$ 2.07

Boy can do the labor.

	White Masters						Second Masters						Sub Masters					
	Before Beading		Wax		Copper		Before Beading		Sub.		Copper		Before Beading		Sub.		Copper	
	lbs	Oz	lbs	Oz	lbs	Oz	lbs	Oz	lbs	Oz	lbs	Oz	lbs	Oz	lbs	Oz	lbs	Oz
	4	14	2	4	2	10	5	5	2	7	2	14	4	4	2	7	1	13
	4	14	2	4	2	10	4	15	2	7	2	8	4	7	2	9	1	14
	5	–	2	6	2	10	5	3	2	7	2	12	4	6	2	6	2	–
	4	14	2	5	2	9	5	4	2	7	2	11	4	5	2	6	1	15
	5	–	2	6	2	10	5	2	2	8	2	10	4	4	2	5	1	15
	5	–	2	4	2	12	5	4	2	8	2	12	4	7	2	8	1	15
	5	1	2	4	2	13	5	1	2	7	2	10	4	7	2	8	1	15
	4	14	2	5	2	9	4	14	2	7	2	7	4	6	2	7	1	15
	5	–	2	5	2	11	5	2	2	8	2	10	4	10	2	9	2	1
	5	1	2	3	2	14	4	15	2	7	2	8	4	10	2	8	2	2
total	49	11	22	14	26	10	51	–	24	10	26	6	44	2	2[illegible]	9	19	9

P.24

/11

N 1913-1
1914—

30

Average price received for records

Dec	1913	62.6 ¢
Jan	1914	63.3
Feb		64.1
Mar		58.6
ap.		60.2
	Average	61.5 ¢

N-1913-12-06 (Date taken from page 9)

Can be checked with NY studio "Log" (Cash books), (also p. 18)

1911 or 1912 · 1912 or 1913

p. 24 Oct. 4th — March 28 [1912] 37,376.45

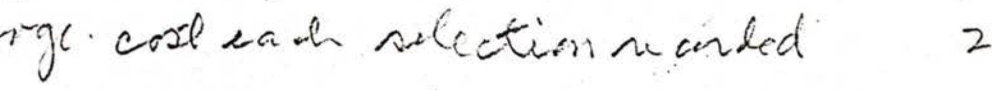
NY. Studio 307 selections were made, averaging
2½ masters per selection, gives
768 masters, — cost per recorded selection 121.75

London Recording Dept. July 31 – Dec 31, incl [1912?]
59 selections made " 11,815.04
115 [2½ masters per selection?]
[148 masters]
Avge. cost each selection recorded 200.25

p. 4 "Submaster Blank" is a black "powder" blank with thin copper [facing? backing? coating?]

pp 22-23 Data here seem to indicate that "Second Master Blanks" and "Sub-Master Blanks" are identical, and ~~that~~ they are the thick blanks [containing powder but looking pretty nearly like plastic] and include cheesecloth and celluloid.

EDS -1
-2
-4
-5



2d master is a female (negative) ?
Submaster is a male for printing? ie.-why hill?

Formula Book.
Kept in safe in vault.

6.35

FORMULA FOR SUB MASTER BLANKS

100 Blanks

De Alco. (80% Recovered)	9,870 Grams	2-6
Wood Flour	48,650 "	2-3
Gas Black	1,225 "	2-3
Phenol Resin	48,650 "	2-6

108395

Blank Weighs 1000 Grams.

Given by Mr. Hoffman, July 19, 1916.

FORMULA FOR SUB MASTER BLANKS

	I00 Blanks	
De Alco. (80% Recovered)	9,870 Grams	2-6
Wood Flour	48,650 "	2-3
Gas Black	I,225 "	2-3
Phenol Resin	48,650 "	2-6

1083.95

Blank Weighs I000 Grams.

Given by Mr. Hoffman, July I9, I9I6.

FORMULA FOR I522 C. BLANK

	Hoffman's Figures	Grams	100 Blanks. Grams	100 Blanks. Pounds
T.A. Lac	I5 3/4 Lbs.	7,I50 I/2	6,III.5	I3.46I4 ✓
Para	35 7/I0 Grms.	37 7/I0	30.5	.0672 ✓
Wood Flour	57 Lbs.	25,878	22,II8	48,7I8I ✓
Chalk	43 "	I9.522	I6,685	36.75II ✓
Gas Black	2 "	908	776	I.7093 ✓
		53,494 2/I0	45,72I	I00.707I
De. Alco.	30 Lbs.	22,700	I9,40I	.427335 ~~63.308~~ 29.3 lb.
				130.00

[illegible] Para Approx 61%
[illegible] Para Approx. 60%
[illegible] " "

53.494 2/I0 Grams - II7 Blanks.
I Blank - 453 Grams

In Operation, June 22-I9I6

Given by Mr. Hoffman, July I9, I9I6.

FORMULA FOR I522 C. BLANK

	Hoffman's Figures	Grams	100 Blanks. Grams	100 Blanks. Pounds	
.A. Lac	I5 3/4 Lbs.	7,I50 I/2	6,III.5	I3.46I4 ✓	10.30%
ara	35 7/I0 Grms.	37 7/I0	30.5	.0672 ✓	.05%
ood Flour	57 Lbs.	25,878	22,II8	48,7I8I ✓	37.50
halk	43 "	I9.522	I6,685	36.75II ✓	28.75
as Black	2 "	908	776	I.7093 ✓	1.30
		53,494 2/I0	45,72I	I00.707I	
e. Alco.	50 Lbs.	22,700	I9,40I	.427335 ~~63.308~~ 29.3 lb.	28.60
				130.00 lb.	

[illegible] Approx 61%
[illegible] Approx. 60%

53.494 2/I0 Grams - II7 Blanks.
I Blank - 458 Grams

In Operation, June 22-I9I6

Given by Mr. Hoffman, July I9, I9I6.

FORMULA FOR VARNISH MAKING

Phenol Resin ✓	I,000	Grams	2.2026 ✓ Lbs.
F. Phenol	60	"	.1322 ✓
Para ×	I0	"	.0220 ✓
Sandarac	I0	"	.0220 ✓
Hex Tet.	73	"	.1718 ✓
De. Alco.	2,000	"	4.4053
Gas Black ×	I,579	"	3.4779 ✓
	4,737	Grams.	10.4338 Lbs. - I Gal. Varnish.

In Operation, April 28, 1916.

Given by Mr. Hoffman, July 19-1916.

Ralph

ANALYSIS OF THE DISC RECORD MFG. DIVISION
COST LEDGER

Pay Rolls
Material Transfer from Windecker
Divisible Expense from all Vouchers, Bills etc,
All Adjustments
Inventory of Raw Material (From Hoffman & Kircher)
Inter-departmental Transfers from Blood & Hoffman
Hoffman's Material Transfer covering material delivered to other Divisions
All Work in Process that has not yet been posted
Journal Entries
Rate Non Divisible Expense
Water, Steam, Electricity, Expense & Labor from Operations 2-I & I4-I
find out how to handle the discards from Hird & Mambert.
rge I4-7 Operation with value of Records returned by Baldwin that were recovered.
Get this Information from Teed
nce your control sheet after you have posted all Mfg. Expense & Work in Process
then begin figuring your Operations as follows.

2-6 Transfer from 2-6 to 2-3, 2-4 & 2-5 all Materials used in these operations. This is to be figured according to the formulars of Powder Blanks, Sub Master Blanks, and Label Blanks found on pages of the Red Book.
Then close 2-6 and transfer the Cost to various Operations.
2-7 to be charged with Varnish as per formular on page.
I4-I2 To be charged according to information given on Hoffman's Report.
I4-II To be charged according to information given on Hoffman's Report.
I4-3 To be Charged with the balance
2-3 Transfer from 2-3 to 2-4 & 2-5 all materials used in these Operations. This is to be according to Formular of the Sub Master Blanks and Label Blanks found on pages of the Red Book.
2-4 Charge I4-II with the Repair of the number of Sub Master Blanks discarded by Haviland. (See Haviland's Report)

Close 2-5 and charge cost to I4-I2
" I4-I2 " " " Mould Division
" 2-7 " " Mould Division
" 2-3 " " I4-2
" I4-2 " " I4-3
" I4-3 " " I4-5

Transfer proportion of Labor, Expense and Material to I4-5 B from I4-5
Close I4-5 and charge cost to I4-6
Transfer proportion of Labor, Expense to I4-6 B from I4-6
Close I4-6 and charge Cost to I4-7
Transfer proportion of Labor, Expense and Material to I4-7 B from I4-7
Close I4-7 and Transfer Cost to I4-7C
" I4-8 " " " I4-5B
" I4-5B " Charge " I4-6B
" I4-6B " " " I4-7B
" I4-7B " " " I4-7C
" I4-7C " " Musical Phono Division

CHARGE
Returned Records with the value of records returned by Baldwin (Get this inform. from Teed)

CREDIT
Returned Records and charge I4-7 with the value of the Records sent to Mary Gallagher to be Washed and re-enveloped.

CREDIT Returned Records and Charge I4-7 C with the Balance. Let Teed take care of this Item.

PHENOL RESIN - POWDER BLANKS - VARNISH AND VARNISHED CHEESE CLOTH

Melt Phenol		
Loading Digestor		
Running	At Silver Lake	
Unloading		
Panning		- 2 - 2 Phenol Resin
Grinding		
Analysis	At Works	

Loading Varnish Cutter	
Unloading	
Mixing Dry Mix	
Adding Gum in Mixer	
Unloading Mixer	
Panning	
Loading Dryer	
Drying	
Unloading Dryer	
Grinding	
Weighing	
Carrying Powder to Moulding Units	- 2 - 3 Powder Blank
Loading Moulds	
Packing	
Putting on tops (capping)	
Trucking moulds to Presses	
Pressing	
Trucking moulds to Pin Ejectors	
Ejecting Pins	
Extracting Blanks from Moulds	
Carrying Moulds to Units	
Trucking blanks to Edger	
Edging	
Trucking blanks to Inspection Room	
Inspecting	
Delivering blanks to Transfer Dept.	

Loading Varnish Cutter	
Unloading	
Mixing Dry Mix	
Adding Gum in Mixer	
Unloading Mixer	
Panning	
Loading Dryer	- 2 - 4 Sub Master Blank
Drying	
Unloading Dryer	
Grinding	
Loading Moulds	
Putting on tops (capping)	
Pressing	
Extracting blanks from moulds	
Inspected	
Deliver blanks to stock room	

Loading Varnish Cutter
Unloading
Mixing Dry Mix
Adding Gum in Mixer
Unloading Mixer
Panning
Loading Dryer
Drying
Unloading Dryer
Grinding
Loading Moulds
Putting on tops (capping)
Pressing
Extracting Blanks from Moulds
Inspecting
Delivering Blanks to Stock Room

- 2 - 5 Label Blank

Weighing Ingredients
Loading Liquid Mixer
Mixing
Filtering
Loading Varnish Cutter
Cutting Varnish
Unloading Varnish Cutter
Filtering
Canning
Delivering to Varnish Plate Room

- 2 - 6 Varnish

Cutting Cheese Cloth
Dipping
Curing
Delivering to Stock Room

- 2 - 7 Varnished Cheese Cloth

C. DAVIS

OPERATIONS ON POWDER BLANKS & RECORDS

POWDER BLANK OPERATIONS

Oper. 2-5 Powder Blank Making

Cutting Shellac X
Mixing (Recovery of Alco)
Grinding
Screening
Final Screening
Loading Hopper
Mould Loading
Packing
Sticking off
Capping
Pressing
Ejecting Pins
Extracting Powder Blanks
Mould Washing
Trucking in Bldg. 24

Oper. 14-2 Inspection & Bevelling

Bevelling } Counting keep separate
Inspection

Oper. 14-3 Reaming & Baking

Reaming
Counterboring - keep separate
Cleaning
Varnishing
Baking
Oiling & Inspecting
Repairing

RECORD OPERATIONS

Oper. 14-5 Record Printing

Printing } mould testing
Sorting } " Separately

Oper. 14-6 Inspection

~~Eye Inspection~~ ✓
~~Machine~~ " ✓
Final " ✓
Edging
[illegible] ~~Edging~~ "
Edge Polishing

Oper. 14-7 Finishing

Edge Varnishing ok
Sorting ok
Numbering
Envelope Labeling ok
Filling
Cleaning }
Enveloping } one operation
Inspection }

Master Mould

$\frac{1}{5000}$ x cost of 1 mould to each record

2 nd Master Mould

.00107 x cost of 1 mould to each record
Divide # of Finished Records by 932 to find # of Moulds used
To find cost per 1000 Records multiply cost per Mould by 1.07

Sub Master Mould

$\frac{1}{313}$ x cost of 1 mould to each record (see 14-5 incl discards)

To find cost per 1000 records multiply cost per mould by 3.20

Formula for 1522 B. Blank
as given by A. Hoffman 5/18/16

Ingrediants in 100 Blanks

	20000 Blanks	6/22/16 117 Blanks	100 Blanks	6/22/16 per A.H. 100 Blanks
T. N. Lac	2467.5286 lbs	15.75 lbs.	12.337643 lbs	13.4615 lbs.
Para	12.3039 "	.0286	.065195 "	.0671
Wood Flour	9827.5858 "	54. lbs	49.137929 "	48.7179
Chalk	7413.7929 "	43. "	37.068964 "	36.7521
Lamp Black	344.8237 "	2. "	1.724119 "	1.7094
Dc. Alco	255.42 gal.	1.325 gls.	1.2771 gal	8.554 ~~8.[illegible]~~

[illegible] lbs. 108.95 lbs.

80% recovery on Alcohol

Real Value } Blanks
Powder

lbs
12.337643 – 16.5¢ – 2.05
.061519 – 2.49 – .15
49.137929 – 1.02¢ – .50
37.068964 – .95¢ – [illegible]
1.724119 – 19.6¢ – .34
1.2771 – .48 gal – .61
$3.[illegible] Value of Powder for 100 Blanks

Same
lbs.
13.4615 – 16.57 cwt. – 2.23057
.0671 – 2.70 lb. – .18117
48.7179 – 1.025 cwd. – .4993
36.7521 – .75 cwd. – .2756
1.7094 – 19.85c – .3393
{8.554 lbs / 1.325 gal – .52 gal – .6890
4.213 100 Blanks

2.6

Varnish Formula
1522 Blank
As given by Hoffman 5/18/16
Formula 1511 for 1522 B. Blank

Ingredients in 100 gallons of Varnish

100.000 grains Resin = 220.26431 lbs.
6000 " Phenol = 13.21585 "
1000 " Para = 2.20264 "
1000 " Sandarac = 2.20264 "
7900 " Hex. Tet. = 17.40088 "
200000 " De. alco = 65.26356 gal or 440.52863 lbs.
15790 " Lamp Black = 34.77974 lbs

lbs. of Varnish in 20000 Blanks (1522)

8.7356 lbs. Free Phenol
1.3436 " Para
1.3436 " Sandarac
10.4801 " Hex. Tet.
39.82 gal. De. alco.
17.1817 lbs. Goo Black
Formaldehyde
= —— No worry

1 gal = 6 3/4 lbs. =
28.3 grams = 1 oz.
454 grams = 1 lb

Varnish Formula for
1522 Blank
As given by A. Hoffman 5/16/16

See Formula on previous Sheet

100 grams Resin
6 " Phenol
1 " Para
1 " Sandarac
7.8 " 6/4
156 " De. alco.

5 o/o of above Lamp Black on total weight of Varnish ground twice thru paint mill.

12 x above = 1 gallon

Ingredients per 100 gallons

120000 grams Resin = 264.31718 lbs.
7200 " Phenol = 15.85903 lbs.
1200 " Para = 2.64317 lbs
1200 " Sandarac = 2.64317 lbs
9360 " 6/4 = 20.61674 lbs.
187200 " De. alco = 67.4983 gal.
16308 " Lamp Black = 35.92070 lbs.

1 gal. de. alco = 6 lbs. 2 oz.
28.3 grams = 1 oz.
454 grams = 1 lb.

Formula of New Com'l. Blank
#1522
as given by A. Hoffman 5/7/16

	grams
14 lbs. 5 oz. D.N. Lac	= 6497.5
50 lbs. Alcohol	= 22700.
32.4 grams Para	= 32.4
57 lbs. Wood Flour	= 25878.
43 lbs. Chalk	= 19522.
2 lbs. Lamp Black	= 908
	75537.9

346 to 407 grams per blank
454 grams to lb
1 lbs to Blank
116 Blanks

		Per 100 Blanks
D.N. Lac	3234 grams	= 7.12334 lbs.
Alcohol	11299 "	= 4.07406 gal.
Para	16 "	= .03524 lbs.
Wood Flour	12881 "	= 28.37224 "
Chalk	9717 "	= 21.40308 "
Lamp Black	451 "	= .99339 "

From 12 men turn out 2000 of 1497
" 14 " " " 1600 " 1522

Average 376 grams per blank

Formula of new Com'l. Black
(Brushed Black)
Formula #1412
As given by A. H. Hoffman 4/7/16

Per 100 Blacks

T. N. Lac	5046.6 grams	= 11.115859 lbs.
Para	25. "	= .05506 "
Wood Flour	25160.8 "	= 55.420264 "
Cal. Carbonate	10093.2 "	= 22.231718 "
Gas Black	705.2 "	= 1.553303 "
De. alco	5289.3 "	= 1.90715 gal.

1 gal. de. alco = 6 lbs. 2 oz.
28.3 grams to oz.
454 grams to lb.

E.A. Eible

a/c 4-2 WAX MASTER PREPARING ✓

Master

Graphite ← adjustment (see Mc Mullen about quantity drawn from Lab
36 Copper wire
Brass wiring pins
~~Brass Contact pins~~

a/c 4-3 PRELIMINARY PLATING

Copper anodes from 81-2
Copper Sulphate
Dope (From Lab.) Copper Ink
H 2 SO 4
Copper Contacts
Brass Pins
Plating Elec.
Linen

a/c 81-2 GENERAL PLATING

Copper Anodes
Copper Sulphate
Dope ~ Caminole
H 2 S O 4
Copper Contacts
Brass Pins
Plating Elec.
Linen

a/c 81-3 LATHE ROOM

Filter Paper ?
Benzole
Wax Paper
Rosin Sticks
Vaseline
Acetone

a/c 81-4 MOULD BACKING

Lead Wire
Alcohol

a/c 81-5 CELLULOID PRINT ROOM

Sub Master Blanks (from 2-4)
Prepared Cell Discs (from 81-9
Prepared Cheese Cloth (from 2-7)
Sticking Solution (from Lab.)
Graphite ?

a/c 81-7 LABELS

Label Blank (from 2-5)
Varnish Paper
Nitrate Silver
Caustic Soda
Comp. & Electros
Nickel Anodes
Nickel Salts

Master

a/c 81-8 GRAPHITING 2ND & SUB MASTERS.

Graphite adjustment (see McMullin about quantity drawn)

"

a/c 81-9 CELLULOID DISCS

Celluloid Discs
Dipping Solution (from Lab.)

a/c 2-2 PHENOL RESIN

Phenol Crystals
Formaldehyde

Musical

a/c 2-3 POWDER BLANKS

from 2-2

Denatured Alcohol
Gas Black
Wood Flour
Hexamethylene Tetramine (6/4)(From 2-6)
Para phenylene diamine " 2-6

//

a/c 2-4 SUB MASTER BLANK

Denatured Alcohol (from 2-3)
.005 x .540 Copper
Gas Black (from 2-3)
Phenol Resin (from 2-2)
Wood Flour (from 2-3)

Master

a/c 2-5 LABEL BLANK - 81-7

Denatured Alcohol (from 2-3)
Gas Black (from 2-3)
Hex. Tet. (6/4) (from 2-6)
Phenol Resin (from 2-2)
Wood Flour (from 2-3)

a/c 2-6 VARNISH MAKING

Denatured Alcohol (from 2-3)
Free Phenol
Hex. Tet. (6/4)
Penta (washed)
Para phenylene diamine

Musical

Varnish Making (cont'd).

Phenol Resin (from 2-2
Hydrochloric Acid
Sandarac
Nigrosene

a/c 2-7 VARNISHED CHEESE CLOTH figure & balance
Varnish from 2-6
Cheese Cloth

Master

a/c 14-3 VARNISH PLATE FLOWING

Varnish (From 2-6)
Potash
Denatured Alcohol (from 2-3)
Cyanide

Musical

a/c 14-4 TRANSFER BLANK 〃

Powder Blanks (From 2-3)
Varnish Plates (from 14-3)
Grain Alcohol
Denatured Alcohol (from 2-3)

a/c 14-5 RECORD ~~PLATING~~ Printing 〃

Grain Alcohol

a/c 14-7 FINAL INSPECTION & ENVELOPING. Record Finishing 〃

Filler (from Lab.)
Alcohol (From 2-3)
Envelopes
Glue
Labels
Oxide of Zinc
Egg Albumen

	ROUGH	ROUGH FIN.	FINISHED
12" Disc Blank			
10" Disc Blank			
Standard Blank			
Commercial Blank			
Recording Blank			
Special Master Blank			
Kinetophone Blank			

20000 Blanks

1522

2467.5286 lbs TN Lac
255.42 gal alco
12.3039 lbs Para
9827.5858 " Wood
9413.7929 " Chalk
344.8237 " LampBlack

20000 lbs
Varnish

8.9356 lbs True Blanol
1.3436 " para
" Sandarac
10.4801 lbs 6/4
3.82 gal alco
17.2819 lbs L. Black
Formaldehyde

1000	gms	Resin.
60	"	Phenol.
10	"	Para-
10	"	Sandarac.
79	"	4/4
2000	"	De alco
157.9	"	Lamp Black.

1 gal 1511 Varnish

Solution #1 Material for five gallons Celluloid

Sticking Solution.

Camphor 3700 grams =	8 1/4 lbs.	at .515	$ 4.25
Amyl Acetale 14800^{cc}=	3.9 "	=4 gals." 3.00	12.00
Labor	5 hours	at	.78
Over-head			.39
$3.484 per gallon .871 .. quart .4355 .. pint			$17.42

81-5

Filler Solution Material for 15 lbs. = 1 gal.

Egg albumen 450 grams	= 1 lb.	at	.85	-	.85
Zinc Oxide 5100 "	= 11 1/4 "	at	.06		.675
Labor	5 hours	at			.78
Overhead					.39
$.17966 per lb.					$2.695 2.70

18
15
90
18
270 per gal.

v

Bees Wax and Rosin Sticks - 1000 pcs.

Rosin 52500 grams	= 115.86	= 116 lbs.	at .0725	= 8.41
Beeswax 17500 "	= 38.6	= 39 "	" .45	= 17.55
Linen - 2 yds.			" .75	= 1.50
Waxed Paper - 250 sheets			"	.1125
Labor 50 hours			"	8.53
Over-head			"	4.26
$.0403625 ea. New Price 4/1/15			per 1000	$40.3625
.036449 " C Edison			" "	36.45

✓

CELLULOID SOLUTION 4-1

Dipping Solution for Celluloid Blanks.

Absolute alcohol	7.5 gal.	@ $3.75 per gal'. -	$28.12
Amyl acetate - -	.4 "	@ 2.75 " " -	1.10
Film flow - - -	1.8 "	@ .38 " lb. -	5.50
Labor -			2.00
Over-head -			1.00
	9.7 gal.	cost	$37.72
		per gal. cost	$ 3.88865 $ 4.00

1 gal. solution will dip 120 - 10" Discs.

GRAPHITE

10	lb.	of	097 Graphite	@	15¢	lb.
10	"	"	Caustic Soda	@	06¢	"
10	"	"	Hydrochloric Acid		05¢	"

Cost when finished with overhead labor, etc. $2.07 lb.

New price Oct 1914 - \$ 2^{32} lb. per Chas. Edison

13^{00} lb from

Ed Chemical Co. 9/25/10

New Blank supersedes 7/1/15

Material That Goes Into 1000 pcs. 10" records,

Raw Powder Blank and Varnish.

~~[illegible]~~ lbs.	Formaldehyde	.08 1/2	lb.
~~[illegible]~~ "	Wood Flour	23.70	Ton
14.5 "	Gas Black	.06 1/2	lb.
170.5 "	Denatured Alcohol	.31	Gal.
3.5 "	Penta Chloral Phenol	.48	lb.
3 "	Paraphenylen	62.5	lb.
188.5	Phenol	.07 5/8	lb.
~~[illegible]~~ 3.6 "	Hexa Tet	.48	lb.

Raw Materials $52.205

-11

See Page 18

6/8

COMMON BLANK

100	lb.	Wood Flour	.01185
2	"	Gas Black	.065
25	"	Phenol Resin	.148
472	gr.	Hex. Meth.	.48
45	lb.	Alcohol Den.	.31 gal.

1 Gallon Alcohol = 6.2 lbs

100 lbs.	Wood Flour	1.1850	
100 "	Rosin	14.8000	

Will make 92 blanks.

100 "	Alcohol Denatured	4.1333	
2 1/2"	Gas Black	.1625	of 1000 gr. each
3 "	Copper	1.4825	

Sub Master Blank.

✓

Materials Used in the Master from the Vault until it Leaves Prelim.

Bath

Wire 36

Graphite

Wiring Pins (3)

Contact Pins (1)

Contacts (1)

Anode 1 per 5 records

Linen 2 pcs. for 5 records (Filters in tanks 3 yards linen = 350 records.

Electricity for plating - 1 each (rubber sponges brushes mops) for 500 records

Distilled Water

Ice

Electrolyte.

6 7 lb. Rolled Anode

453.6)

Average weight of new anodes 3080 grams.

27716

1 new anode per bath each week 3584

5 Wax master plated in bath each week

5 x 110 ÷ 3080 = 17.8% of each anode put into the master bath is used for plating masters.

17.8% of anodes is chargeable to wax masters in the Prelim bath.

82.2 % of anode cost is chargeable to General Bath.

The Average weight copper deposited upon each wax master is about 110 grams.

Cast Anode –

Average weight 8.4 lbs @$.22 per lb

Regular Anode $ ~~1.93 ea~~ 2.22 9/1/15

Nickel Anodes $ .46 lb

.02875 oz

a/c 2 - 2

Phenol Crystals M.T.

Formaldehyde

'a/c 2 - 3

Denatured Alcohol

Wood Flour

Gas Black

6/4 (Hex. Tet.) - 2-6 Not

Para 2-6

Phenol Resin 2-2

a/c 2 - 4

Denatured Alcohol 2-3

Gas Black 2-3

Phenol Resin 2-2

Wood Flour 2-3

.005 Copper —

2 - 5

Denatured Alcohol	2-3
Gas Black	2-3
6/4 (Hex. Tet.)	2-6
Phenol Resin	2-2
Wood Flour	2-3

2 - 6

Denatured Alcohol	2-3
Free Phenol	
6/4 (Hex. Tet.)	
Paraphenylene diamine	
Phenol Resin	2-2
Sandarac	
Hydrochloric Acid	
Nigrosene	

2-6

Regular Varnish.

5	lb.	Phenol
2	"	Paraphen
7.9	"	Hex. Tet.
4	"	Penta Chloral Phenol (washed)
145	"	Denatured Alcohol (19-1/3 gal.)
100		Phenol Resin

✓

5)5.4
6.1x
1 1/8# to Per C
61
48 450
1 3/4 Gal 18
1/7/15

COMMERCIAL BLANK a/c 2-3

+1000 Gal for Mix Washing
tools 1/8#

	Per 100 Blanks	
		86
Denatured Alcohol ~~<50 % Recovered>~~	~~8676.5 grams.~~	
	Value	
Wood Flour	27650 ,675 "	60.956
Gas Black	550 ,079 "	1.2125
6/4 (Hexamethylene Tetramine) from 2-6	1350 1.428 "	2.9[illegible]
Paraphenylenediamine from 2-6	100 .358 "	.220
Phenol Rosin 15 1/10#	6850 6.191 "	15.100
	$8.675 C	

Blank Weight 365 grams

.80 lb

4536) 365000
36288
2120

Mr Nickerson gives values 1/7/15
7.76 per C tel

Note Bill

New Blank 9/1/15

	Per C Blanks	
F. N. Lac	11 5/6#	2.26
Den. Alco. 4 1/2#	1 3/4 gal. lbs	→ 2-6
Para	17/100 #	.18
Wood Flour	79#	.81
Gas Black	1 6/10#	.10
		M.C. per C

1/15/15 19

4

SUB MASTER BLANKS a/c 2-4

alcohol 1 gal : 6 lbs 2 oz

Total used For 100 Blanks

Per Blank					From
1.09 lbs	Denatured Alcohol (80 % recovered)	3.22073 gals 22# = 3 2/3 Gal	9870	gramms	2-6
1.09 lbs	Wood Flour	109#	48650	"	2-3
.027	Gas Black	2 7/10#	1225	"	2-3
1.09 lbs	PhenolResin	109#	48650	"	2-6
	.005 x .540 Copper		1475	"	Transfer

Blank weighs 1000 gramms

May

[illegible] gals alco @ [illegible] = 1.55
3.22207
[illegible] wood @ 1.0756 - 1.17
[illegible] @ 19856 - .53
109 [illegible] 669346 - 72.95
76.15 Cost of 100 Blanks

56

1.09) 6 lbs
5.45
.18 %

245.6604 lb Cost

6.125) [illegible]

June

21.73947 lbs.
3.22207 gals Alco @ 52¢ - 1.67
109 lbs. Wood " 1.0256 = 1.12
2 7/10" Gas " 19.856 = .53
109 Phenol " 669346 = 72.95
76.27
Cost of 100 Blanks

1/15/1915 a

LABEL BLANK a/c 2-5

alcohol 1 gal = 6 lbs 2 oz 63/4

Get this from

Per Blank			Per 100 Blanks	
.023 gal .0185 lbs	Denatured Alcohol	(80% recovered)	.2731 gal 1 85/100 # = 3/10 gal 837 gramms	2-6 -
.09 lbs	Wood Flour		9# 4186 "	2-3 -
.009 lbs	6/4 (Hexamethylene Tetramine)		9/10# 418 "	2-6 -
.0022 "	Gas Black		22/100# 210 "	2-3 -
.09 "	Phenol Resin		9# 4186 "	2-6 -

Blank weighs 90 gramms.

19x30

.2731 gal. alco. @ 48¢ gal - .13
9 lbs. Wood @ 1.0456 - .09
.9 lbs HMT. @ 48¢ lb - .43
.22 lbs gas @ 19.85b - —
9 lbs Resin @ 66.93¢ lb - 6.02
6.67 Cost for 100 blanks

21.7365 lbs cost

454
~~453~~.6 gramms = 1 lb
alcohol 1 gal = 6.~~72~~ lbs

VARNISH a/c 2-6

		Per Gal. ~~Per 100 Gal.~~	
Denatured Alcohol	[illegible] lb = .58 Gal	2086. ~~1914~~ gr. ~~5111~~ gramms	1914 per gal.
Free Phenol	.17 [illegible]	79.2 gr. ~~211~~	" 79.2 gr
C/4 (Hexamethylene Tetramine)	[illegible]	105.6 gr. ~~282~~	" 105.6. grams
Paraphenylenediamine	.01455 lb	6.6 gr. ~~17~~	" 6.6 gr
Phenol Resin	2.907 lbs	1320 gr. ~~3525~~	" 1320 gr. per gal
Sandarac	.0581 lbs	26.4 gr. ~~70~~	".26.4 gr
Hydrochloric Acid		--	
Nigrosene	.0 [illegible] lb	1.65 gr. --	1.65 gr.
		3153.45	

Weight of varnish on each blank

1 gal = 37½ records

1 gal = 732 Records 6/29/16
Mr Kircher

Sub master Blank (varnish)
for Moore (14-11)
117B

100	grams	Resin Black Varnish
1	gram	Para
1	"	Sandarac
7	"	6/4
1/2	"	Naphthaline
145	"	Alco.

Have varnish used on 1 blank

VARNISHED CHEESE CLOTH 2-7

1320 gr.	Resin	2-2
52.8 "	Phenol	
105.6 "	6/4	2-6
5940 "	Do Alco	2-3 ?

7418.4 gr. = 1 Gal. Varnish

1 Gal varnish to 27 yds Cheese Cloth

Record Industry

Alcohol	Master
Acetone	"
Brass Wiring Pins	"
Brass Pins	"
Benzole	"
Copper Wire #36	"
Copper .005 x 540	"
Copper Sulphate	"
Copper Contacts	"
Copper Anodes	"
Caminole (Dope)	"
Caustic Soda	"
Comp & Electros	"
Celluloid Discs	"
Cheese Cloth	"
Cyanide	Musical Rec. Disc
Dipping Solution (from Lab.)	Master
Denatured Alcohol	"
Envelopes	Musical
Egg Albumen	"
Formaldehyde	"
Free Phenol	"
Filler (from Lab.)	"
Graphite (from Lab.)	Master
Gas Black	"
Grain Alcohol	"
Glue	"
H 2 SO 4	"
Hex. Tet. 6/4	Musical
Hydrochloric Acid	"
Labels	"
Lead Wire	Master
Linen	"
Nitrate Silver-	"
Nickel Anodes	"
Nickel Salts	"
Nigrosene	Musical
Oxide of Zinc	"
Plating Elec.	Master
Phenol Crystals	Musical
Phenol Resin	"
Para	"
Pumic (Washed)	"
Potash	"
Resin Sticks	Master
Sandarac	"
Vaseline	Master
Varnish Paper	"
Wax Paper	Master
Wood Flour	Musical
[illegible]	"

DISC MASTER BLANKS

2676-12-1	Wax Making	
" " 2	Moulding	
" " 3	(Drilling, Reaming, Rough Cutting (Recessing, Edging.	Roughi
" " 4	Inspection	
" " 5	Shaving	Finishing
" " 6	Final Inspection	
" " 7	Canning	
8	Packing	

DICTATION MACHINE BLANKS.

2681-12-1	Wax Making
" " 2	Moulding
" " 3	Reaming
" " 4	Edging
" " 5	Rough Cutting
" " 6	Inspection
" " 7	Shaving
" " 8	Final Inspection
" " 9	Boxing
" " 10	Packing

4 MINUTE RECORDING BLANKS

2677	-12-	1	Wax
"	"	2	Moulding
"	"	3	Reaming
"	"	4	Edging
"	"	5	Rough Cutting
"	"	6	Inspection
"	"	7	Shaving
"	"	8	Final Inspection
"	"	9	Boxing
"	"	10	Packing

STANDARD 2 MINUTE I.C.S. BLANKS

2679-12-1	Wax Making
" " 2	Moulding
" " 3	Reaming
" " 4	Edging
" " 5	Rough Cutting
" " 6	Inspection
" " 7	Shaving
" " 8	Final Inspection
" " 9	Boxing
" " 10	Packing

CYLINDER MASTER BLANKS

2680-12-1	Wax Making
" " 2	Moulding
" " 3	Boring & Reaming
" " 4	Rough Cutting
" " 5	Edging
" " 6	Beviling
" " 7	Shaving
" " 8	Inspection
" " 9	Canning

March 1st, 1915.

SO 2783.

To cover Labor and Material to manufacture moulds for the Disc Records also includes Sub Master Blanks, Label Blanks and Varnished CheeseCloth.

Year ending 2/28/16

Supersedes SO 2187

- -

SO 2784

To cover Labor and Material for making Disc Records also to include boxing, numbering and labeling.

Year ending 2/28/16

Supersedes SO 2189

- -

SO 2787

To cover Labor and Material for experimenting on the Disc Record.

Year ending 2/28/16

Supersedes SO 2193

- -

SO 2801

To cover Labor and Material to manufacture Disc Master Blank Complete (Wax) this order includes manufacturing Wax, Moulding, Shaving, Finishing and whatever other operations necessary to finish this blank.

Year ending 2/28/16

Supersedes SO 2676.

over

PHENOL RESIN - POWDER BLANKS - VARNISH
AND VARNISHED CHEESE CLOTH

Melt Phenol)
Loading Digester)
Running) At Silver Lake
Unloading)
Panning) - 2 - 2 Phenol Resin

Grinding)
Analysis) At Works

Loading Varnish Cutter)
Unloading)
Mixing Dry Mix)
Adding Gum in Mixer)
Unloading Mixer)
Panning)
Loading Dryer)
Drying)
Unloading Dryer)
Grinding)
Weighing)
Carrying Powder to Moulding Units) - 2 - 3 Powder Blank
Loading Moulds)
Packing)
Putting on tops (capping))
Trucking moulds to Presses)
Pressing)
Trucking moulds to Pin Ejectors)
Ejecting Pins)
Extracting Blanks from Moulds)
Carrying Moulds to Units)
Trucking blanks to Edger)
Edging)
Trucking blanks to Inspection Room)
Inspecting)
Delivering blanks to Transfer Dept.)

Loading Varnish Cutter)
Unloading)
Mixing Dry Mix)
Adding Gum in Mixer)
Unloading Mixer)
Panning)
Loading Dryer) - 2 - 4 Sub Master Blank
Drying)
Unloading Dryer)
Grinding)
Loading Moulds)
Putting on tops (capping))
Pressing)
Extracting blanks from moulds)
Inspecting)
Deliver blanks to stock room)

Inspecting	4 - 2 Wax Master Preparing
Numbering	
Inspect back for length of curing	
Put in Vacuum Machine	
Graphited	
Put on Turn Table	
Insert pins and wiring	
Blowing off	
Microscope Inspection	
Del'd to Master Plating Room	
Blowing off	4 - 3 Preliminary Plating Masters
Insert rubber cork	
Put on Spider	
Put in plating bath	
Moving jars every 10 minutes	
Raising Amperes	
Taking out of bath	
Remove from holder	
Washing with distilled water	
Del'd to Gen'l bath	
Blowing off	4 - 3 Preliminary Plating 2nd & Sub Masters
Washed	
Put on spider	
Put in plating bath	
Raising Amperes	
Taking out	
Remove from holder	
Washed with distilled water	
Del'd to Gen'l bath.	
Celluloid Discs graphited (light coat)	81 - 8 Graphiting 2nd & sub Masters.
Del'd to print room	
Celluloid Prints graphited (light coat)	
Del'd to Repair & Inspection	
Rec'd from Repair & Graphited (Heavy coat)	
Put in Polishing Machine	

Loading Varnish Cutter
Unloading
Mixing Dry Mix
Adding Gum in Mixer
Unloading Mixer
Panning
Loading Dryer
Drying
Unloading Dryer
Grinding
Loading Moulds
Putting on tops (capping)
Pressing
Extracting Blanks from Moulds
Inspecting
Delivering Blanks to Stock Room

- 2 - 5 Label Blank

Weighing Ingredients
Loading Liquid Mixer
Mixing
Filtering
Loading Varnish Cutter
Cutting Varnish
Unloading Varnish Cutter
Filtering
Canning
Delivering to Varnish [illegible] Room

- 2 - 6 Varnish

Cutting Cheese Cloth
Dipping
Curing
Delivering to Stock Room

- 2 - 7 Varnished Cheese Cloth

C. DAVIS

Edison's Notes on Releases and Production.
(Kept in safe opposite inner vault)
E6454-1 (Typed original)

EL454-1 Typed orig

1920(?)

NOTES

24 days in each month is actual working average.

At this time May 12 average daily production is 25,000 records from 44 working moulds.

Total product 600,000 records per month.

I understand this would give 35,294 records for each of 17 supplement numbers, if no catalogue numbers are printed.

As to the hits, it would be impossible to cull from all the new music enough good hits per month to make up a good attractive list of more than 4 tunes, or 2 records. (See Hayes' letter.)

As this is insufficient to warrant a special hit list, we can pick out 6 more of the great hits of past time, long since forgotten, and far superior to the 4 hits published in the month at hand. This would make 10 hits, or 5 records, and they would be real hits and probably all good sellers and few returns.

If we make up all of the 10 hits from recent hits you will be compelled to put on 2 hits good, 1 pretty good, 1 only fair and the other 2 dances, 4 very indifferent. Then you would satisfy nobody and have many returns.

With 10 hits (5 records) as a hit list, we now have 32 tunes, 16 records, for regular monthly list. I think that, in view of our mould capacity, this should be reduced to 20 tunes, 10 records,

which would give us:

Monthly	(Hit list	5 records 10 tunes
	(Regular new list	10 records 20 tunes

Keep this constant until such time as we have increased our mould making capacity to a point where we can adopt a new cheme.

If the total orders for regular

list averages 10,000 for each number

and hits 18,000 " " "

this gives total for month Regular 100,000

" " " " " Hits 90,000

190,000

Leaving capacity right now of 410,000 for catalogue numbers, which is 68% of old catalogue to 32% of Hits and New Regular.

At present our capacity is increasing at the rate of 1000 records daily, and with new process and better men there is no reason why it should dimish, except from fire, etc., labor, etc., lack of materials, etc. I am almost certain that if no more experiments or changes are permitted then the output will be 40,000 daily by July 1st or sooner. This would give you 960,000 records monthly.

If we print 100,000 of new Regular
and 90,000 " Hits
we can print 710,000 of Regular Catalogue

In manipulating Regular Catalogue I think we should grade its selling capacity into 4 grades, so that we can get a few of all numbers quickly and maintain constantly a stock of all numbers. We should start on grade A, This filled then B and so on.

It will require some data and considerable planning to do this in the best way. Manipulating the moulds through baths and printing room in this case is more complicated than appears on the face. I find that some of our finest tunes were never properly instrumented or recorded; that many were injured masters, and some we have ruined and lost the mast and submaster. These I can have made over with great improvement.

Note - All of this memo. is based on a guess as to number you put out, Hits and supplements and Regular Catalogue. Corrections can be made accordingly to get my idea, as this is only a starter for discussion.

We should start now since, we are all on the new technique I understand and should proceed as follows:

1st: Take account of number of moulds operated and cycles performed.

2nd: Keep account of moulds rejected.

3rd: Take account of unmatched moulds on hand belonging to the working groups of 44 at the end of the day you start this record.

4th: At end of the month you can get percentage of unmatched pairs to the total intact. Say you find it 5%. Then to prevent waiting we should make 5 or 6% more of each tune than is required.

5th. Another way is to keep a considerable number of 2nd females in stock after you have made all the working moulds you want. Then the moment a pair becomes unmatched, notify the director who pulls 2nd females from vault and in 3 days (theoretical) the match is made good.

Note - If we had room to store them we could save all our females. Then you could get any catalogue print in 3 days. There would be 24 females for each tune and I think we can strip far more than 8 times from nickel. This would shorten the time on old catalogue stuff from 39 days (theoretical) to 3 days (theoretical).

A test of a couple of 2nd females should be made to see how many strippings are possible from one female before it shows any impairment, using the long process for making female and working mould.

E6454-2
Typed orig.

Supplement regular 12 Records - (Regular)

Hits 5 - (10) tunes. Works 3 months ahead. (Specials)
If hit comes out in N. Y., to be on sale 3 months after hearing, if recording is good. If not good, it is either cut out or made over. This, of course, extends the period of 3 months.

If only 2 hits they fill in with next best stuff even if no good.

After Miller gets lists it takes 2 weeks to record and get over - sometimes a month.

Shortest time with lead technique is 30 days.

Hence 3 weeks collect
3 " Miller Recording
4 " Plating
10 " or 2-1/2 months
to get ready for printing with enough moulds.

Previously to new hit idea, we had regular list.
In this was included the few hits.

029.4
781.973
(1920)
E645

Original Notes by T. A. E.
& several typed copies.
About Disc Record, Production

Letter to Theodore Edison concerning
new method of plating
(Document files)

Wile

file

M A R C H
19 ---- 20
Twenty-6th.

Mr. Theodore Edison,
#264 Newbury Street,
Boston, Mass.

My dear Theodore:

Our new method of plating:

A- Wax master plated	- gives you	Master Mould
B- Master Mould plated-	" "	Master Female
C- Master Female "	" "	Second Master
D- Second Master "	" "	Working Female
E- Working Female "	" "	Working Mould.

We record three wax masters, A.-B,- and C. They are then plated and put into the vault.

When a supplement is made up of 15 numbers (30 selections) the master moulds are withdrawn from the vault, and the best master mould mechanically goes through the process as explained above.

To-morrow I will send you the second installment.

Sincerely yours,

CBH.MA

Music Room.

E6588 Copy 1

Edison Diamond Disc Records

(Hill and Dale)

Manufacturing Process

as of 1920 to 1929

from

Wax Masters

to

Condensite Records

by

Paul B. Kasakove

July, 1964

Electroplating Process for Disc Record Moulds

In July 1920, I was engaged by Mr. T. A. Edison to modernize the entire process for making the nickel-faced copper moulds that were used to press out the disc records. It was taking approximately three weeks from the time the newly recorded Wax Masters were delivered to West Orange from our New York Studio, before the first prints from the Wax Masters could be heard. As a result of the experimental work by Mr. T. A. Edison and myself, the process was changed so that the three-week period mentioned above was reduced to three days. The first disc record made by this improved process is on display in Mr. Edison's Library. (~~E-34 &~~ E-35)

This improved process remained in use right up to the time the Disc Record Manufacturing Division was shut down. It may be described as follows:

1. The Wax Masters were recorded in our New York Studio and delivered to the plant at West Orange in the evening of the same day that the recordings were made. Mr. Walter Miller, who headed our New York Studio at the time, and who lived in West Orange, would usually bring the Wax Masters in on his way home. It was the practice to make three Wax Master Recordings for each selection, and they were identified by a serial number and the letters A, B, and C.

2. On the morning following the delivery of the Wax Masters, they were turned over to the Plating Department employee who was responsible for the grafiting operation. This grafiting process, the purpose of which was to provide the recorded face of the Wax Master with an electro conductive surface, had replaced the gold coating process, because it saved a full day's time. At first, the grafite that was used to coat the wax was purchased as ordinary commercial grafite, and subjected to an elaborate purification process which consisted of fusing the grafite with caustic soda, then dissolving out all the impurities, rinsing thoroughly in distilled water, with a final rinse in pure grain alcohol. Later I discovered a small company in Connecticut that specialized in making and selling grafite, purified for electroplating purposes, and I was able to buy this grafite cheaper than I could purify it myself, so we discontinued the purification process. The grafiting of the Wax Masters took only a few minutes. They were placed on a table which could be made to revolve slowly while being brushed with a very fine silk bristle brush saturated with grafite, which just barely touched the face of the Wax Master. At first Mr. Edison was somewhat concerned that this brushing action might result in removing some of the wax, thereby causing poor reproduction. However, I was able to reassure him by letting him listen to and inspect two records of the same selection, one made by the old Gold Coating Process, and one by the grafiting process described above. He was unable to see or hear any difference. When the grafiting of the Wax Masters was completed, they were brought down to the Master Plating Room located just below the Grafiting Room in the same building, (22A).

3. As soon as the Grafited Wax Masters were received by the man responsible for the copper plating of the masters (Peter Dempsey), he would mount each Wax Master on a suitable, specially designed, plating holder, which permitted the master to be rotated while semi-submerged, in a Copper Plating Bath, with the electric current passing from a Copper Anode in the bath through the Copper Sulfate-Sulfuric Acid solution to the grafited face of the Wax Master, depositing a coat of copper on to the grafited face. It formerly took several days before the deposited copper was heavy enough (about .030") to be stripped from the Wax to be used as the Copper Master. However, we were able to cut this time down to 24 hours or less. As soon as the recorded face of the Wax Master was completely covered with Copper, an operation that took about four or five hours, the Wax Master and holder, were transferred to another bath, which was a cylindrical hard rubber pot containing a more concentrated copper-plating solution, and in this bath, the Wax Master was suspended face down, and completely submerged. In the bottom of the hard rubber pot was a Copper Anode. By increasing the concentration of the Copper Sulfate solution to permit higher current densities, and by rapid circulation of the solution between the plating baths and the central storage tank, the Copper Masters were heavy enough for stripping from the Wax the following morning.

4. When the Copper Master plated to the Wax Master had reached the proper thickness, the plated Wax Master was delivered to Mr. Frank Clancy, Supervisor of the Lathe Department on the 3rd floor of Building 24. Here it was mounted on a Lathe, the outer edge turned down until the line of separation between Wax and Copper became visible, and then the Copper Master was stripped from the Wax. The Wax was returned to the Silver Lake Wax Department for remelting. The Copper Master would have a brass lug soldered in the center of the back of the mould and returned to the Plating Department.

5. In the Plating Department, the first step was to place the Copper Master face up on a turn-table of a polishing machine, so designed as to permit the turn-table to rotate, while a circular brush, fed with a rouge polishing compound rotated slowly, with the bristles in contact with the face of the Copper Master. Although this polishing operation produced a completely clean surface on the face of the Copper Master, it did not affect adversely the sound reproduction.

6. After polishing, the Copper Master was mounted on a Mould Holder, placed in an electro-cleaning bath (a Sodium Sulfate solution), for about two minutes to insure a chemically clean surface, rinsed in distilled water, and then immersed in the "8-4" solution and rotated for about two minutes. It was then removed, rinsed again in distilled water, and placed immediately, while still wet, in the Nickel Plating Bath.

7. The Nickel Plating operation under the old process required at least ten hours to get the required thickness of coating (about 0.0004"). By increasing the density of the Nickel Plating Solution using Glacial Ascetic Acid to improve conductivity, and immersing the Copper Master in the solution face down instead of semi-submerged as was previously done, and using Nickel Shot for an anode instead of a solid cast anode, the total time required to get the desired thickness of nickel was reduced from ten hours to two hours. The Nickel Shot was contained in a hard rubber, round, tray at the bottom of the hard rubber cylindrical plating bath, and was periodically removed from the bath and washed free of the Nickel Sludge which is formed during the Electroplating process. The sludge was replaced by new Nickel Shot. Additional changes made to speed up the Nickel Plating consisted of raising the temperature of the Nickel Solution to about 120°F, and circulating it rapidly between a central storage tank and the individual plating baths. As a result of these various changes, we were able to reduce the plating time from ten hours to two hours. Because of the increased current density, there was a tendency occasionally toward the formation of an excess of Hydrogen gas bubbles to be released, which if allowed to settle on the face of the mould being plated would result in a series of small holes in the plating. To prevent this, we added some hydrogen peroxide, which combined with the excess Hydrogen to form water.

8. After two hours in the Nickel Plating Bath, the Copper Master was removed from the bath, rinsed quickly and thoroughly, and transferred without any delay into the Copper Plating Bath, which was also a cylindrical hard-rubber pot, with a specially designed copper anode at the bottom of the pot. The Copper Master attached to its Mould Holder, was suspended face down in the Copper Plating Solution in this pot, and rotated rapidly with the current on. The cast copper anodes used for this high speed copper plating process were made in our own copper foundry located in the rear of Building 1, and were so designed as to permit of a maximum surface facing the cathode (master) and also to permit the Copper Sludge which was formed in the plating process to be washed to the bottom of the plating bath by the circulating copper plating solution. The copper plating solution was stored and heated in large crocks from which it was pumped and fed individually to each Copper Plating Pot. Since any interruption in the electroplating before the desired thickness of copper was obtained would spoil the mould, it was necessary to guard against such an interruption by having available at all times an emergency source of current. This was accomplished by keeping a sufficient number of Edison Nickel-Iron Batteries in a separate room in Building 22A. These batteries were connected in such a manner as to permit of an immediate switch in the event of a power failure. The electroplating process was continuous - 24 hours a day, seven days a week. I was on call at all times in the event that anything went wrong with the process.

9. On the morning following the start of the copper plating of the female to the Copper Master, the Master with its plated female was removed from the Copper Bath and its holder, washed, dried, and delivered to a room adjacent to the plating room. Here a trained lathe operator turned down the beaded copper plated edge, until the line of separation between the nickel face of the female, and the Copper Master, became visible. Then on a machine specially designed by Sam Moore for this purpose the Master and female were separated cleanly, without in any way marring the surface of either one. The time required for making a Female from a Copper Master totaled about 24 hours as compared with a minimum of three days by the old process.

10. The Nickel faced Female Mould, after stripping from the Copper Master, was sent up to Mr. Clancy on the 3rd floor of Building 24 where a brass lug was soldered to the center of the back of the mould, so that it could be screwed to the Mould Holder, and returned to the Plating Department. Here it was given a quick polish similar to that given the Copper Master, but since the Nickel face was so much tougher than the copper face on the Master, the polishing compound in this case consisted of a fine emery paste. After polishing, the female mould was put through the same cycle as the Copper Master, as described above; i.e., Electro-clean, Rinse, Rotate in "8-4" Solution, Rinse, Nickel Plate 2 hours, Rinse and place in Copper Plating Bath until the following morning. It was then removed, the plated mould stripped from the Female, and sent up to Mr. Clancy to be finished to glass-like smoothness on the back, so it could be used to press out the male recording on its nickel face, on to the Disc Record Blanks. This was called the Working Mould, and if properly handled could print several hundred Disc Records.

11. The complete cycle as described above, from the receipt of the Wax Master Recording to the completion of the Working Mould, could be repeated as many times as necessary to print the number of records needed for sales. The Copper Master could produce about ten Females. Each Female could produce at least a dozen Working Moulds, and if by any chance something happened that would interfere with the completion of the number of moulds needed, it was always possible to start with one of the other two Wax Masters kept in the Vault for emergencies.

12. All three Wax Masters on a given selection were put through the above cycle so that at least one print from each Master could be listened to by our Music Committee, of which Mr. Thomas A. Edison was a member, and this Committee chose one of the three for production. However, to insure that nothing happened that would cause any deterioration with the face of the Copper Masters, I arranged that after they were no longer needed for immediate use, they were put through the plating cycle again, but were not separated from the plated female. The Copper Masters with the female mould plated to them for protection were stored in the Vault for possible future use and safe keeping.

Paul B. Kasakove

July 2, 1964

Formulas of Solutions used in Plating Department

"8-4" Solution 8 gallons Distilled Water - 400 cc of a 5% solution of Selenious Acid (5 gms Acid to 100 cc H_2O)
(To enable separation of plated surfaces)

Electrocleaning Bath Concentrated solution of Sodium Sulfate made slightly alkaline with Sodium Hydroxide

High Speed Nickel Plating Solution

Nickel Sulfate + 6 H_2O Crystals	- 430 gms per liter
Glacial Ascetic Acid	5 to 6 cc per liter
pH - 6 to 6.2	

High Speed Copper Plating Solution

Specific Gravity at 34°C	1.250
Copper Sulfate .5 H_2O Crystals	350 gms per liter
Sulfuric Acid	32 cc per liter

Wax Master Copper Plating Solution

Copper Sulfate .5 H_2O Crystals	250 gms per liter
Sulfuric Acid	24 cc per liter

Paul B. Kasakove

July 2, 1964